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AMATEUR Radio

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Since 1910

EXCITEMENT OF CONTESTING

- 2022 contest calendar
- Ross Hull and his gang
- DIY digital dooverlackie
- Rig Review: Lab599 TX-500

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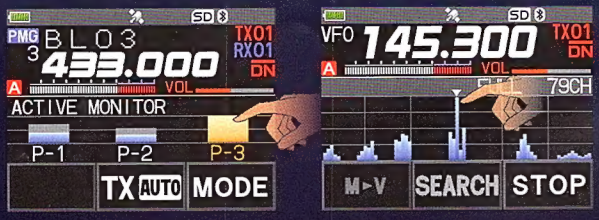

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AMATEUR Radio

Serving Australian radio amateurs since 1933

Volume 90
Number 1
2022
ISSN 0002-6859

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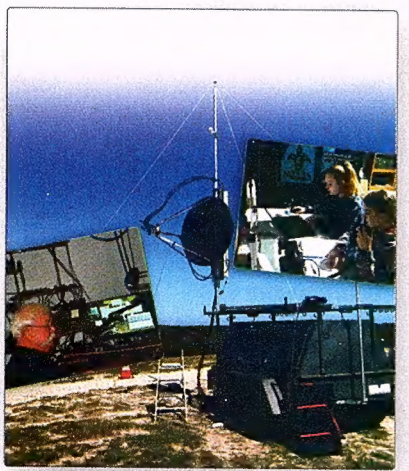

This issue's cover: main photo – tri-band microwave dish at VL3L/p station at Enfield in the 2021 Spring VHF-UHF Field Day. Left – Martin VK7GN contests from his shack. Right - Lakia VK7LJB on the laptop and Aiva on the mic during the 2021 ALARA Contest last August.

Editorial

Registered office
Unit 20 11-13 Havelock Road
BAYSWATER VIC 3153
Australia
Phone: 03 9729 0400
Fax: 03 9729 7325

Production deadlines
All articles, columns, Hamads, and advertising bookings for Volume 90, Issue 2 – **11 February 2022**.

NEXT ISSUE: Test and Measurement

Contributions to Amateur Radio

Amateur Radio is a forum for WIA members' amateur radio experiments, experiences, opinions and news. Manuscripts with drawings and/or photos are welcome and will be considered for publication. Articles attached to email are especially welcome. The WIA cannot be responsible for loss or damage to any material. Information on house style is available from Phil Fitzherbert.

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Back issues are available directly from the WIA National Office (until stocks are exhausted), at $8.00 each (including postage within Australia) to members.

Photostat copies
If back issues are unavailable, photocopies of articles are available to members at $2.50 each (plus an additional $2 for each additional issue in which the article appears).

Disclaimer
The opinions expressed in this publication do not necessarily reflect the official view of the WIA and the WIA cannot be held responsible for incorrect information published.

Amateur Radio Service

A radiocommunication service for the purpose of self-training, intercommunication and technical investigation carried out by amateurs; that is, by duly authorised persons interested in radio technique solely with a personal aim and without pecuniary interest.

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Registered Office of the WIA
Andersson House
Unit 20, 11 Havelock Road
Bayswater, Victoria, 3153
Tel: (03) 9729 0400 Fax (03) 9729 7325
email: *nationaloffice@wia.org.au*
http://www.wia.org.au

All mail to
PO Box 2042 BAYSWATER VIC 3153
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Editorial

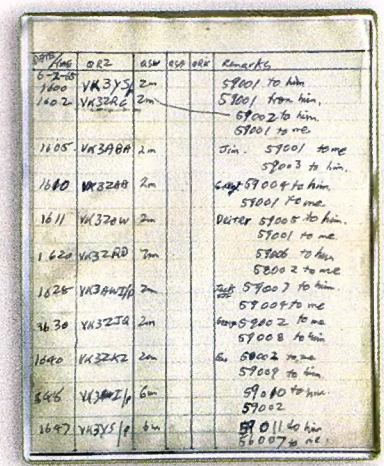
Roger Harrison VK2ZRH

The rewards of having a go

There's no doubt that contesting is exciting. If it wasn't, this aspect of amateur radio 'as sport' would not have survived to this day. As a keen shortwave listener (SWL) in the mid-1960s, I entered the 1963 Remembrance Day Contest. Bands full of stations – curiously intoxicating. Submitting a log under my WIA-assigned SWL No. – L3158 – I was chuffed to score a not too shabby 243 points (*AR*, Dec 1963, p.11). I was hooked. In mid-1964, while a student at RMIT, local amateur Alan Reid VK3AHR (SK), suggested I "have a go" at the next licence exam. I did. I passed.

My first contest under my newly-minted VK3ZRY was the 1965 John Moyle Memorial National Field Day. Running QRP on six and two metres as a portable, I entered a log with no expectations and won the VK3 section, the first VHF-only operator to do so! (*AR*, Sept 1965, p.13).

Last year, while out and about one weekend with Trent Sampson VK4TS, we visited a couple of Sunshine Coast hamfests, where we crossed paths with a colleague in common, Greg Ackman, founder of Mobile One antennas (www.mobileone.com.au). Greg built the business from a garage-based operation during the 1970s. Hence, we knew him as a magazine advertiser.



First page of VK3ZRY log, John Moyle NFD 1965.

Trent urged Greg to sit the Foundation exam at the Sunshine Coast hamfest that Sunday. Greg was reluctant, believing he wasn't ready. Trent urged him to have a go. He did. He passed. Welcome Greg VK4BBX!

Change and renewal

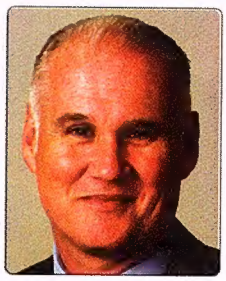
Doubtless you have noticed the design change to our magazine banner. Same name, but quite a new look. The purpose is to refresh the look and 'feel'. Here we are at Volume 90, so I thought it would be apposite to 'amp things up' since the magazine's banner was last re-designed – back in Volume 78, March 2010, the year the WIA celebrated its centenary.

This current exercise actually began back in 2020, after I was appointed Editor in Chief in July. The 2020 WIA President Greg Kelly VK2GPK raised it with myself and our layout artist Sergio Fontana VK3SO. After discussing and deciding on some design principles and goals, Sergio quickly produced some samples. However, the matter went into suspension as "the heat was on" to maintain the momentum of completing five issues before Christmas.

The 'strap' above the banner, and forming a component of it, is to spark the interest of potential readers browsing newsagents. The purpose is to highlight – without being 'shouty' – the wide range of topics covered in *AR*. Truth be told, we could extend the list so that the strap would run down the right hand edge, across the bottom, up the left hand edge and back to the banner! Practicality won out.

I think Sergio has succeeded in producing a clean, attractive, eye-catching new banner. We hope you like it, too. Well, most of you. Long experience has taught me that you can't please everyone.

You may notice a variety of other changes this issue, too. As I often heard in my previous career serving government ministers, "I commend it to the house!"



Board comment

Scott Williams, VK3KJ

This is WIA President, Scott Williams (VK3KJ) and a warm welcome to the first edition of AR Magazine for 2022.

I am sure like you, we were all hopeful that 2021 would see COVID-19 behind us, or at least a significant reduction in case numbers. Of course, the Omicron variant quickly put a stop to that with significant case numbers and tragically the loss of many lives across Australia.

Let's all hope that early in 2022 we can see a reduction in the spread of this terrible pandemic and a return to some normality in the way we live right across Australia.

The Year Ahead

2022 is again shaping up as another very busy year within the WIA.

With the Annual General Meeting (AGM) now locked in for Saturday 7 May 2022, it will be a busy time within the WIA as we finalise 2021 and prepare for the AGM. Like last year, the AGM will be held as a virtual event, and we will release details shortly of the commencement time and appropriate access details.

Board nominations for 2022 will also close at the end of January, so by the time you receive this edition of *AR* Magazine, most likely nominations would have closed. Subject to the number of nominations received, this will determine if an election will be held.

Returning Officer John Marshall will confirm in early February that nominations received are valid and will then either declare successful Directors or, subject to the number of nominations, confirm that an election will take place.

I wish all members that nominate all the very best in the Board elections and a strong Institute is when there is a strong interest to join the Board by many and contribute to the future success of the WIA.

Many readers of *AR* Magazine I am sure would have participated in the Trial Australia Day Contest that was held on Australia Day, Wednesday 26 January 2022.

This contest was only recently introduced as a Trial for 2022. Thank you to Trent Sampson (VK4TS) and Alan Shannon (VK4SN) for pulling this all together and getting the contest off the ground.

Once the contest has concluded, feedback and comments will be sought and changes considered for a potential inclusion to the permanent contest calendar for 2023.

There is of course lots of activity within the WIA as we engage with many different stakeholders. The WIA will be meeting with the ACMA in late January to discuss the ACMA work plan for 2022 and how the WIA can support and contribute to this workplan.

I look forward to reporting on this activity in the near future.

The first WIA Board meeting for 2022 got underway on Tuesday 25 January. The WIA Board will continue to meet twice each month and also meet as necessary to deal with various matters as they arise.

The WIA Board is always happy to address any matter and we welcome feedback to *nationaloffice@wia.org.au*

On a final note, the WIA Board of Directors was saddened to hear of the passing of Mike Subocz VK3AVV / VK3JV / AI7MS on Wednesday 5 January 2022 after a long illness.

Mike was the creator of the very popular VKCL Contest Logging Software. Mike leaves behind a tremendous legacy of his hard and dedicated work and his love for amateur radio.

The WIA extends its sincerest condolences to Mike's family and friends and will be deeply missed by all.

On behalf of the Board, I hope all readers enjoy this edition of *AR* Magazine. We hope you, your family and friends stay safe and well through these difficult times.

Thank you once again to all those members for supporting the WIA and a special thanks to all of those volunteers that make the WIA what it is.

Best Wishes,
Scott Williams – WIA President
VK3KJ

Plan ahead

Operate within the band plans:
http://www.wia.org.au/members/bandplans/about/

WIA news

Diamond jubilee for OSCAR 1, the 1st private satellite and a ham radio pioneer

Launched 60 years ago on 12 December 1961, barely four years after Russia's Sputnik 1 achieved orbit and ignited "the space race", OSCAR 1 established a host of 'firsts' and set the stage for what is now a burgeoning global industry.

OSCAR 1 – Orbiting Satellite Carrying Amateur Radio – foreshadowed today's CubeSat industry. At the end of 2021, more than 1600 CubeSats were in Earth orbit – of which more than 1000 were launched in 2020!

Orbiting for just 22 days, OSCAR 1 was heard by over 570 amateurs in 28 countries, including Australia. OSCAR 1 was in a group payload of satellites aboard an Agena rocket launched from Vandenberg Air Force Base near Lompoc in Southern California.

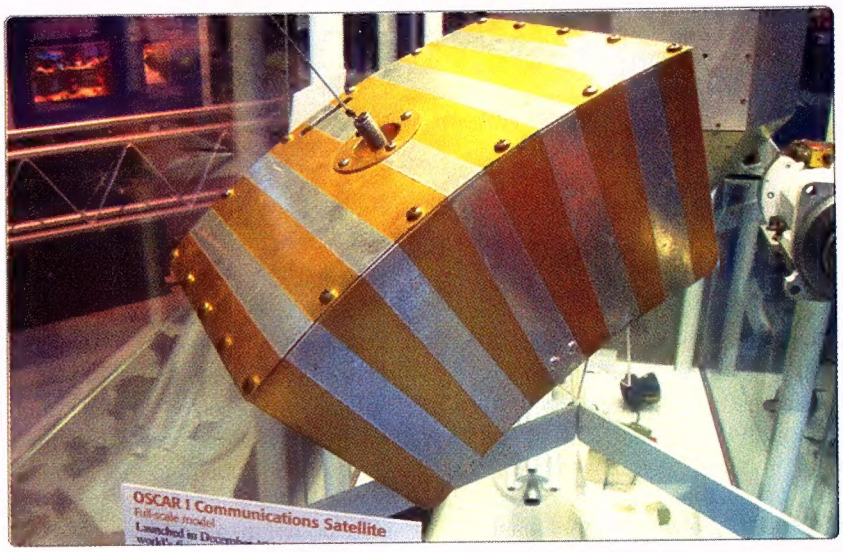
The satellite weighed 4.5 kg, carried a beacon on 144.983 MHz, transmitting "hi", the speed of which was controlled by a temperature sensor inside the spacecraft. It decayed after 312 orbits on 31 January 1962. Recordings of the reception of OSCAR 1's beacon can be heard here: www.dd1us.de/spacesounds%202a.html

Some 200 people contributed to the development of OSCAR 1, which achieved the following series of 'firsts':

- First private, non-government/military spacecraft to reach Earth orbit.
- First 'smallsat'.
- First spacecraft to 'piggyback' on another launch.

Spurred-on by the success of the early amateur satellites, Australis OSCAR 5, built in 1966 by Melbourne University students, was launched on 23 January 1970.

Since those heady days of the early space industry era, amateurs from more than 22 different countries have launched more than 70 satellites, exploring both digital and analogue satellite technology.



Many of the latest birds have been school experiments based on the CubeSat development, training scientists and engineers. CubeSats are providing a fillip for Australia's re-emergent space industry, according to reports from Space Australia (*https://spaceaustralia.com/news*).

LoRa signal makes it to the Moon and back

On 5 October last year, a Dutch radio amateur and three colleagues succeeded in sending a LoRa (short for long range) chirp spread spectrum signal to the Moon and back using the 25 metre dish at the Dwingeloo radio telescope facility.

Jan van Muijlwijk PA3FXB, along with Tammo Jan Dijkema, Thomas Telkamp PA8Z and Frank Zeppenfeldt PD0AP, used an off-the-shelf Semtech LR1110 RF transceiver chip operating on 430 MHz to feeding a 350 watt amplifier. This system fed into the 25 metre dish at Dwingeloo, aimed at the Moon; 2.44 seconds later, the spread spectrum signal was received by the same chip. One of the messages even contained a full LoRaWAN frame, the team reported on *https://lacuna.space/lora-moon-bounce/*

Developed by Semtech, LoRa is a long range, low power wireless platform that has become the de facto wireless platform of Internet of Things (IoT).

Lacuna Space reported that the Dwingeloo radio telescope, operated by the CAMRAS foundation, has a history of being used in amateur radio experiments and is now often used for moonbounce experiments, but this was the first time a data message was involved using a small RF chip. Commissioned in 1956, Dwingeloo played an important role in the early exploration of the structure of the Milky Way using 21 cm hydrogen radiation.

"With the LR1110 chip we also measured the round trip time of the message, as well as the frequency offset due to Doppler caused by the relative motion of the Earth and the Moon. From the round trip time we calculated the distance to the moon," the team reported, which was 730,360 km. "Both distance and frequency offset matched very well with predicted values calculated using NASA's JPL Horizons ephemeris system."

Details on Australian amateur experiments with LoRa digital transmissions were presented in this magazine last year, Vol. 89 No.3 (pp 26-33), published on 13 May, authored by Dale Hughes VK1DSH and Dimitrios Tsifakis VK2COW.

Flock of new amateur satellites

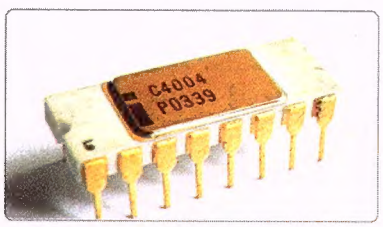
Chinese hams successfully launched a new amateur radio satellite, XW-3 (CAS-9) on Boxing Day last year. The new satellite piggybacked off another launch and carries a range of payloads, including a 145/435 MHz linear transponder, UHF CW and GMSK telemetry transmitter, visible light camera and an experimental thermoelectric generator. Details at: https://amsat-uk.org/2021/12/18/xw-3-cas-9-launch/

On 13 January, a SpaceX Falcon 9 Transporter-3 carried 105 satellites into low-Earth orbit, including several amateur radio payloads. The Tevel mission comprises eight satellites, each with an FM transponder with an uplink on 145.970 MHz and downlink, plus beacon transmissions, on 436.400 MHz.

The EASAT-2 and Hades CubeSats also have 2-m to 70-cm transponders, with Hades additionally carrying a camera module that downlinks pictures in Robot 36 format.

More details can be found on the AMSAT UK website, at: *https://amsat-uk.org/*

Golden anniversary for the 4004



Announced in the 15 November 1971 issue of US industry journal, *Electronic News*, Intel's 4004 was a 4-bit central processing unit (CPU) that became the first commercially produced microprocessor, and the first in a long line of Intel CPUs.

The 4004 helped 1970's electrical engineers link electronics with microprocessors, which have since become indispensable in the following 50 years.

Intel purchased the rights from Nippon Calculating Machine Corporation, hence the 4004 supported a simple calculator in an era where arithmetic calculating machines were electromechanical and bigger than a typewriter. Arguably, the 4004 displaced the slide rule.

In 2020, the global market valuation for microprocessors reached $83.9 billion, evidence of their entry into almost every aspect of our daily lives, from mobile phones through to cars, TV sets, the ubiquitous personal computer, to everyday medical instruments and medical implants like heart pacemakers.

A shortage of microprocessors for cars in 2021 impacted automotive sales.

The manufacture of CPUs has created some of the electronics industry's juggernaut companies – from Intel and Apple, through Samsung and Huawei, to the two largest contract chipmakers in the world – Taiwan's TSMC and United Microelectronics Corporation (UMC).

Rig Review

From Russia, with love

A first look at the Lab599 TX-500

Simon Rumble VK2VSR

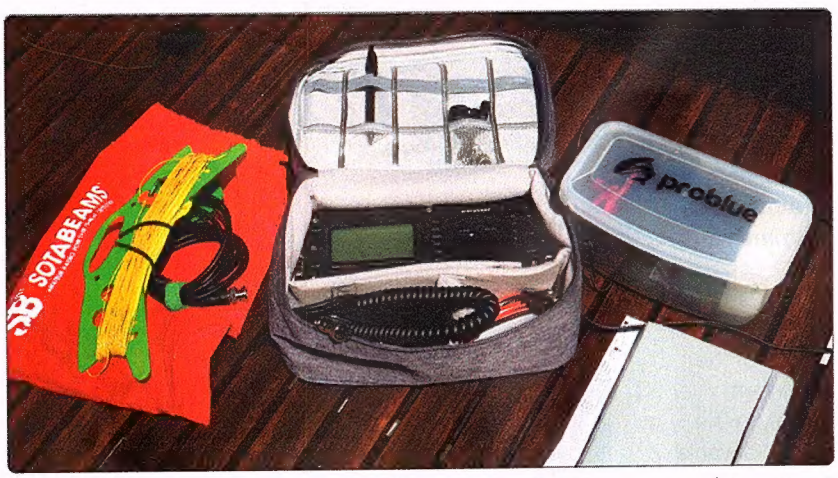
In early 2020, I started hearing about an exciting new portable transceiver that had popped out of a new company based in Siberia, Russia, and designed for the adventurous outdoor ham. The feature list reads like a summit and park activator's wish list: extremely low current drain in receive, light and compact design, housed in an extremely strong milled aluminium case and protection from dust and liquids.

After quite some time lusting after the rig, watching videos of it in use and reading reviews, I decided it was time to get one as an upgrade from my aging Yaesu FT-817. I do a lot of camping and want to do more outdoor activations, climbing peaks and activating national parks. Covid lockdowns have only made my feet itchier.

Ham Radio Outlet is the distributor in the US and the main conduit to buy the device, though they've been persistently out of stock, with orders shipped as stock arrives. Apparently, the new company is selling all the devices they can make, not helped by global component shortages.

This compact HF/6-m rig for the portable market sports well laid-out controls that make for straightforward operation in the field.

Express DHL shipping cost US$80 on top of the US$900 device, which saw AUD$1,370 coming off my credit card. The Australian taxman wants a slice, too, so I ended up paying another $232 in GST and the fees DHL charges to sort out the paperwork. All up, it cost me AUD$1,600. From order to delivery took 19 days, with about seven days in actual transit as I constantly hit the DHL site for status updates.

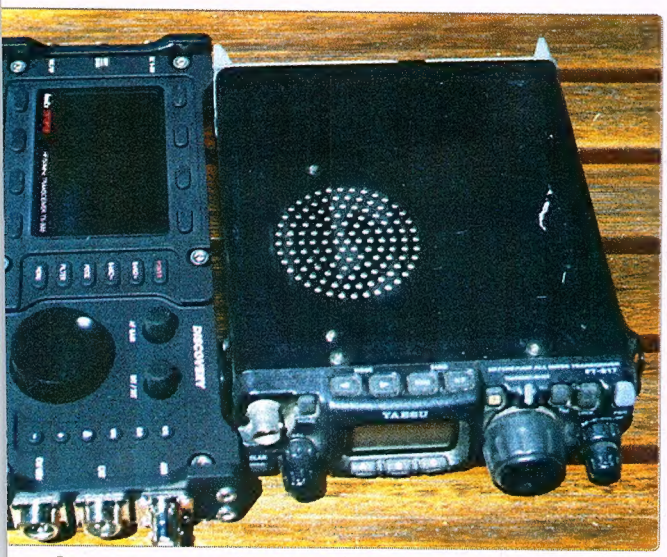


My current portable setup. Everything fits into a small padded camera bag, except the hefty lead-acid battery.

Unboxing

The design is unusual in that it is low and flat, only 30 mm thick, with controls and display on top so you can operate it in your lap or on a table top. All the connectors attach to screw-in GX-12 connectors – commonly seen in aviation equipment – protruding out the sides.

There's no built-in speaker, as part of the water and dust resistant design. It means one of those connectors will either be for the



Comparison to my well-loved FT-817. The rig's only 30 mm thick, including knobs, weighs 550 grams and designed for a top-down view that gives superb ergonomics on a table or your lap.

included speaker-mic, or the (also included) 3.5 mm connectors for an external headset with a button for PTT.

Inside the box:

- Speaker-microphone, with coiled, flexible cable
- USB CAT cable, to control the rig and to upgrade the device firmware
- Fused power cable (I immediately snipped off the battery lugs and replaced them with Anderson Powerpoles)
- Headset and microphone 3.5 mm adapter with PTT
- CW 3.5 mm adapter for a key
- Spare GX-12 connector so you can wire your own digital audio connector.

What you don't get

There are two things missing from the TX-500 that might be showstoppers for you: an internal battery and an antenna tuner. The obvious comparison product would be the Icom IC-705, with its internal battery pack. However, with that battery pack you only get 5 W or the possible 10 W output, meaning you'll probably end up with an external battery anyway.

Lack of a tuner is another thing. Lots of portable rigs are coming with tuners built in. The tuner in the Xiegu G90* is legendary for its wide range and ease of use. An alternate argument is that, if you're operating on low power, you probably want resonant antennas. Sometimes easier said than done. In any case, I've got an Elecraft T1 auto-ATU and getting the TX-500 to output a tone for it is a simple matter.

*Reviewed in Issue 5, 2021: *https://tinyurl.com/4dtskkw6*

Interface

I really like the thought that has been put into the rig's human interface. It demonstrates a good understanding of the challenges of operating in the field, with buttons for the most common functions and a simple menu system for everything else.

The screen is nothing short of superb. A monochrome screen might seem an anachronism these days, but what you gain is unbeatable visibility in bright sunlight and high contrast at night with an automatic backlight (that you can turn off, for power savings). In the accompanying photo, I've attempted to demonstrate how it looks in the direct sunlight on a sunny Spring day, though it's hard to photograph. In person, it looks even better.

The big, rubbery VFO knob for tuning and parameter changes has a commanding feel, with two knobs above it controlling audio gain and incremental tuning. Buttons in the middle next to the display control power, band changes, modes and filters. A long press on MODE flips between USB and LSB as expected, and a long press on FILTER enables adjustment of the DSP filter.

On the right-hand side, you can toggle and clear incremental tuning, access VFO memories and lock the VFO. The plus and minus keys change the tuning increments; having these as their own hardware buttons makes for very rapid switching between scanning the bands and fine tuning once you find something.

Above and below the screen are function keys arranged in 'pages' that you cycle through. A long press accesses settings for the function. It's quick and easy to access, modify and toggle functions like noise reduction, preamp and attenuator, notch filters and tuning tone.

One feature that's easy to overlook is the built-in clock. A small lithium battery is the only user-replaceable component under the warranty, but should provide years of clock operation. You can set it to UTC and always have the time as you're filling in the log.

In direct sunlight, the screen is easily readable, even better than this photo captures.

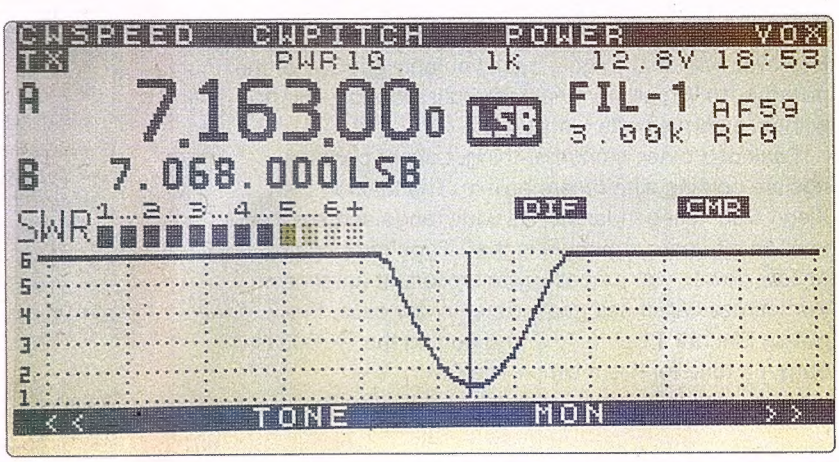
A pair of sturdy metal legs fold out from the back to angle the rig upwards if you're using it on a table, or similar.

How'd it go?

The rig is a modern software-defined radio (SDR) design with output power up to 10 W and very flexible filtering. There's bandpass filters for all 11 ham bands from 1.8 MHz to 50 MHz, and general receive coverage from 500 kHz to 56 MHz. I haven't had a chance to do much work with the rig itself as Sydney has been in lockdown and my QTH doesn't have a great setup for HF, hence the attraction of portability.

The panadapter gives a view up and down the band from your current VFO setting, adjustable to narrow-in on the band segment you want. In transmit, the panadapter shows a graphical view of your output so you get a visual idea of your signal's frequency and amplitude.

On receive, you can switch between four adjustable filter



You can quickly dial-in the tuning on narrow bandwidth antennas like my magnetic loop, seen here.

widths and change three bands of audio equalisation. The DSP noise reduction has a broad range and, in my listening, really effectively wiped-out noise while keeping the signal intelligible. On transmit, there are two separate filters and equalisation. The built-in compression is designed to give your voice more punch on SSB.

I'm really thrilled by the built-in SWR sweep mode. A long press of the 'TONE' button causes it to transmit a reduced-power sweep of the whole band to display the SWR. It's great for dialling-in my magnetic loop's very touchy tuning and I can see in the field it'd be a good sanity check on your antenna. Of course, you're transmitting so don't keep it on too long: the case warms up and it was drawing about 16 W at 13 V.

Speaking of power, this rig is a real miser on your portable battery pack. Receive current can be down to 100 mA with volume right down and keeps it low with more realistic settings. You'll see about 1-3 A current draw on transmit, which is pretty hard to beat. All in all, you're going to get more out of your battery, which is often the heaviest part of a portable kit.

The bad?

So, what's not to like? There's not a lot to quibble with here.

Having the connectors coming out the sides is a bit messy and the screw-on connectors take a bit of time to get set up. This is the price you pay for water and dust resistance.

There's no supplied cable for data mode audio. Instead, a 7-pin GX-12 connector is supplied and you can solder it up yourself. That's nice and flexible, but soldering the tiny connectors is far from easy for those of us with poor fine motor skills. I'm still working on mine. It'd be nice if they supplied a ready-made 3.5 mm TRSS connector and another spare connector for those wanting something additional.

I'm not a CW operator, but the device uses relays to switch between RX and TX, so it doesn't provide full break-in QSK operating. This might be a problem for seasoned CW operators.

Good	Bad
• Weight	• No built-in speaker
• Rugged	• Connectors out the sides a bit fiddly
• Weatherproof	• Soldering the GX-12 connector
• Low power draw	• No tuner
• Great ergonomics	• No battery
• Great screen	• No full break-in
• SWR sweep	• HF only; no 2-m or 70-cm

Summary

All up, it's a superb rig. It's already popular with the mountain goats and park chasers and should find a solid niche. I can't wait to get out there!

Comparison with the IC-705

The current rig that's probably most comparable is Icom's IC-705, which is exactly double the weight but packs in some impressive additional features and versatility. It was a tough decision for me, but I went for the supreme portability and unique ergonomics. If someone wants to gift me one, I'd be happy to do a side-by-side comparison!

Justin Giles-Clark VK7TW, Scott Wilson VK4CZ, and Ron Cook VK3AFW reviewed the IC-705 in *Amateur Radio* Volume 88 Number 4 in 2020.

	TX-500	IC-705
Price (AUD)	$1,600 subject to exchange rate	$1,849
Weight	0.55 kg	1.1 kg
Power output	10 W	10 W (on external power) 5 W (on internal battery)
Bands	160-m – 6-m	160-m – 70-cm
Modes	SSB, CW, AM, FM	SSB, CW, AM, FM, D-Star
Other features	Panadapter, water & dust resistant	Waterfall, built-in sound card, GPS, Bluetooth
Min. current draw	100 mA	300 mA
Website	*https://lab599.com/*	*https://www.icom-australia.com/amateur_ic-705.html*

The Red Pitaya and PureSignal 2.0

Digital dooverlackie defeats distortion on any transmission mode

Gregory Mew VK4GRM

This article provides a brief introduction to the Red Pitaya, described as a "Swiss army knife for engineers", which is being used here as a software defined radio (SDR). The Red Pitaya can also be used as a multi-function test instrument and as a programmable logic platform; more details are on the product's webpage [1].

There are now a number of variants of the Red Pitaya with different analogue-to-digital (A/D) converter resolutions and sampling rates; I have used the STEMlab 125-14 for this testing.

The SDRlab 122-16 Standard kit has more recently been developed specifically for software-defined radios and more demanding RF applications, but this version was not available when the testing discussed here was conducted.

dooverlackie: an object or machine, that is not understood; something you can't recall the name of.

Digital pre-distortion is a technique that improves the linearity of a power amplifier by reducing the unwanted intermodulation products generated within the amplifier. The software application titled PowerSDR OpenHPSDR mRX PS, freely available on the web [2], implements digital pre-distortion via an internal application called PureSignal.

This article provides a brief overview of the various pieces of hardware and software used for testing the product, and then shows the benefits of digital pre-distortion using PureSignal on the Red Pitaya hardware.

Red Pitaya and software defined radios

The Red Pitaya is an open-source hardware and software product based on a reprogrammable logic chip, a field programmable gate array (FPGA). It can replace many expensive laboratory measurement and control instruments by loading free-of-charge software applications from the 'Bazaar' link on the Red Pitaya website. The source code is published to encourage people to develop new applications and share their results with the community. **Figure 1** shows the Red Pitaya enclosure – the dooverlackie (little larger than a matchbox) – and the PCB inside it.

Pavel Demin, IT Engineer at Université catholique de Louvain [3], developed an SDR as a hobby project, using the Red Pitaya and open source software [4]. The application that I used for the test was the "SDR Transceiver compatible with HPSDR". The digital receiver and transmitter functions run directly on the field programmable gate array, which transmits digital baseband signals over Ethernet by emulating a Hermes SDR using the 'Metis' protocol [5].

This SDR transceiver uses the two receiver inputs and one of the transmitter outputs for the functionality described in this article. The second receiver input provides the feedback path for the PureSignal functionality, as shown in **Figure 2** (later).

PureSignal digital pre-distortion

Amplifiers used for single sideband (SSB) transmission are often assumed to be linear – If 0.5 W input gives 5 W output, then we would expect that a 1 W input would give 10 W output. Unfortunately, this is not the case and most real-world amplifiers have some non-linearity.

The impact of this is the generation of inter-modulation distortion (IMD) resulting in signal distortion within the desired transmission passband and 'splatter' that raises the noise level either side of the transmission thus polluting the bands on which it operates.

Fortunately, digital pre-distortion is a technique that improves the linearity of amplifiers, reducing the IMD levels that they generate by 'pre-distorting' the input signal in the opposite direction to the distortion generated by the amplifier. The end result is a cleaner, more linear amplifier response. The Red Pitaya and PowerSDR have the processing power to apply these

Open source refers to computer software that is developed as a public, open collaboration for which the source code is made freely available for use or modification as users or other developers see fit. The term **Bazaar** refers to a book titled *The Cathedral and the Bazaar: Musings on Linux and Open Source by an Accidental Revolutionary*, by Eric S. Raymond, about software engineering methods, examining the struggle between top-down and bottom-up design.

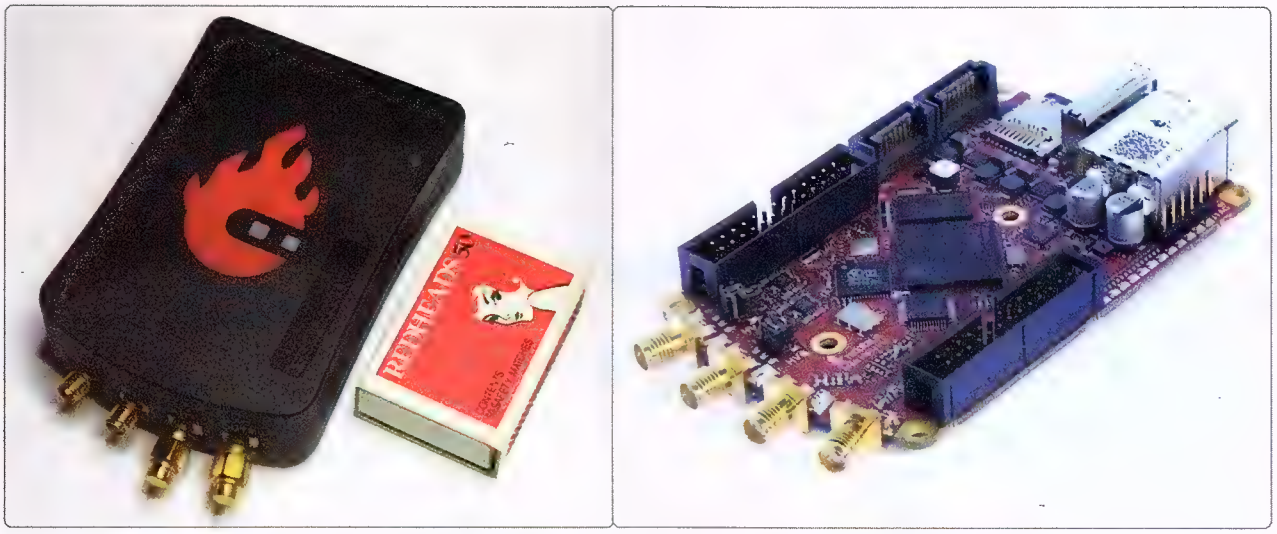


Figure 1. The photo at left shows the Red Pitaya with a matchbox for size comparison. The unit measures 100 x 70 x 24 mm. The photo at right shows the printed circuit board (PCB). The large chip in the middle of the PCB is the FPGA.

corrections in real time. Dr Warren C. Pratt, NR0V, developed the technique and presented it at the German Friedrichshafen HamFest in 2014 [6].

This digital pre-distortion is applied as a separate routine in the PowerSDR OpenHPSDR mRX PS software. The "PS" at the end of the application's name identifies that PureSignal is included in the application.

Test Configuration and results

All tests were conducted using the PowerSDR OpenHPSDR mRX PS v3.4.9 (released 21 March 2018) software with PureSignal Version 2.0. Pavel's software loaded onto the Red Pitaya was red-pitaya-alpine-3.12-armv7-20200628.

All tests were conducted using the TUN (tune) button for single tones and the built in Two-Tone Test from PowerSDR OpenHPSDR mRX PS, *Setup* > *HPSDR Setup* > *Tests*. The Two-Tone Test uses the frequencies of 700 Hz and 1900 Hz (not harmonically related); the test levels are 6 dB down from the single-tone level so as not to exceed the peak voltage excursion limits of the amplifier.

A number of tests were conducted to establish baseline performance of the Red Pitaya

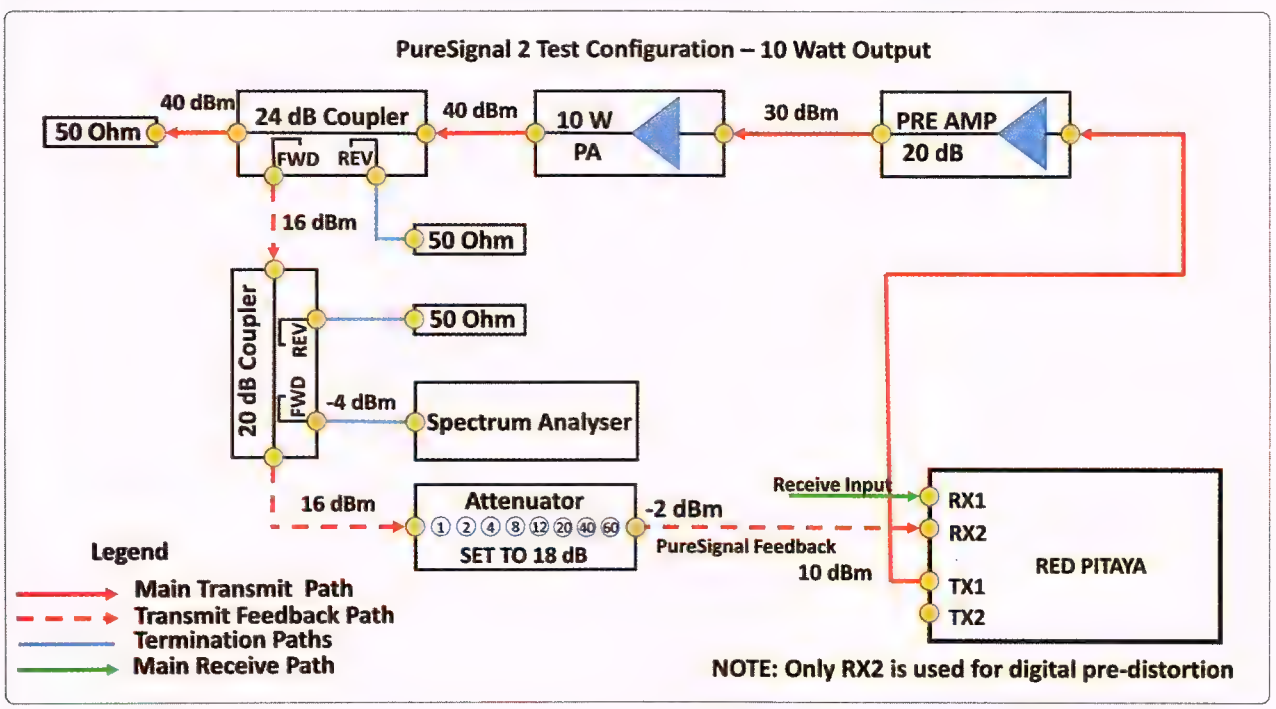


Figure 2. PureSignal test configuration block diagram (nominal signal level values are shown).

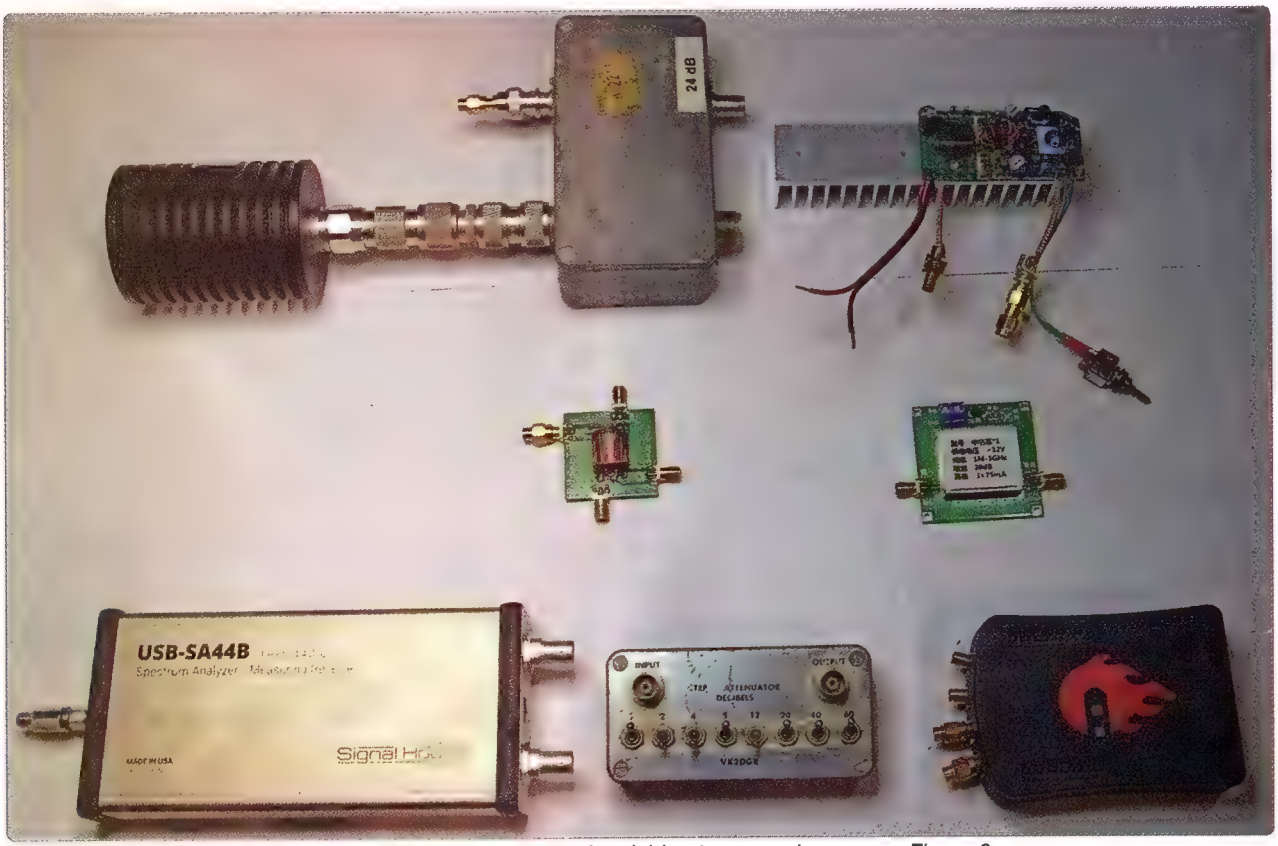


Photo A. The hardware components of the test configuration, laid out more or less as per Figure 2.

and the 10 Watt amplifier, both with and without the application of PureSignal. The SDR's output frequency was set to a representative frequency for each band. The 10 W amplifier was sourced from QRP Labs [7] and built by me from a kitset. This amplifier was driven by a smaller 20 dB gain amplifier with a +20 dBm maximum output level to provide sufficient drive signal for the 10 W amplifier. The test configuration is shown in **Figure 2** (plus **Photo A**) and all tests were done into a 50 ohm dummy load.

Note that the single-tone levels are set to 16 dBm from the 24 dB coupler, equivalent to -4 dBm from the 20 dB coupler into the spectrum analyser. This corresponds to 10 W at the output of the linear amplifier.

The test results are shown in **Table 1**, where the IMD improvement is typically more than 30 dB for most of the HF bands and, in particular, over 40 dB for the 80, 40 and 30 metre bands. The single tone level shown in **Table 1** was used to establish a fixed power level for all tests. However, it is noted that on the 6-m band there is insufficient gain in the amplifiers to meet this level. Note that the IMD levels shown in **Table 1** are relative to the two-tone level and not the single-tone level.

Figure 3 shows the IMD level on the 20-m band with PureSignal turned off, while **Figure 4** shows the level with PureSignal turned on. A delta marker <3> in each figure compares the 3rd order IMD with the level of the two tones, which is referenced by <R3>. Similar results for the other bands are found, as shown in **Table 1**.

It can be seen in **Figure 2** that the feedback level provided to the Red Pitaya was set by an external step attenuator and it was found that this attenuation level stayed fixed at 18 dB, except for the 6-m band where the actual output level

Band	Frequency (MHz)	Single Tone (dBm)	3rd Order IMD (dB) PS OFF	3rd Order IMD (dB) PS ON	PS IMD Improvement (dB)	Variable Attenuation (dB)
160m	1.840	-3.99	-24.1	-58.1	34.0	18
80m	3.549	-4.14	-24.4	-67.6	43.2	18
40m	7.100	-3.99	-26.7	-74.5	47.8	18
30m	10.120	-4.01	-25.0	-74.5	49.5	18
20m	14.100	-4.00	-22.6	-58.9	36.3	18
17m	18.100	-3.98	-22.1	-55.4	33.3	18
15m	21.100	-4.00	-22.0	-53.5	31.5	18
12m	24.894	-4.03	-22.4	-52.7	30.3	18
10m	28.100	-4.03	-22.4	-51.4	29.0	18
6m	50.100	-4.71	-18.3	-38.6	20.3	16

Table 1. Results of two-tone IMD test at 10 W output.

was reduced and consequently the attenuation level had to be reduced.

Conclusion

This article has presented an experimental evaluation of the benefits that can be obtained through the application of digital pre-distortion to a linear amplifier with a suitable transceiver, which, in this case, was a Red Pitaya SDR.

The reduction of the third-order IMD products of typically greater than 30 dB improves the purity of the output signal significantly, reducing splatter in adjacent parts of the band being used.

While amplifiers rated at 10 W output were used here, digital pre-distortion can be applied to much larger amplifiers too, so long as the coupling unit providing the feedback to the Red Pitaya can be configured to provide the feedback at the required level. This could enable less linear, but more efficient, amplifiers to be used by amateurs while meeting unwanted emission limits.

My thanks to Dr David Ingram VK4TDI for reviewing this article before submission and providing the photographs that are used here.

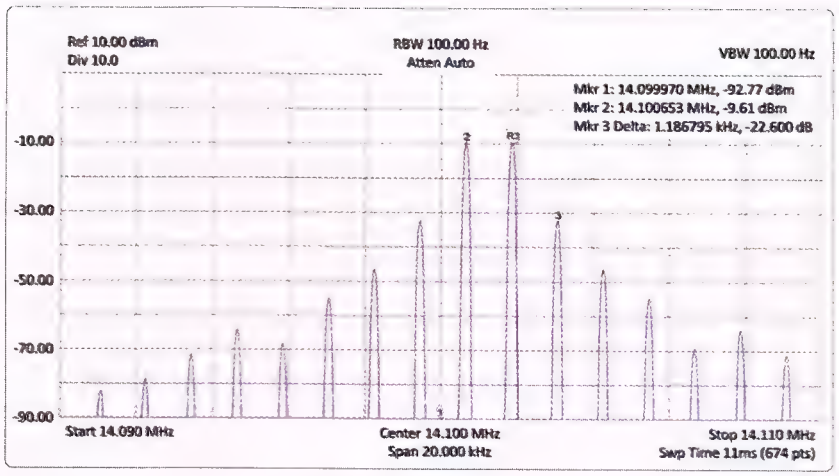


Figure 3. IMD results for 20 metres, with PureSignal OFF – 10 Watt output.

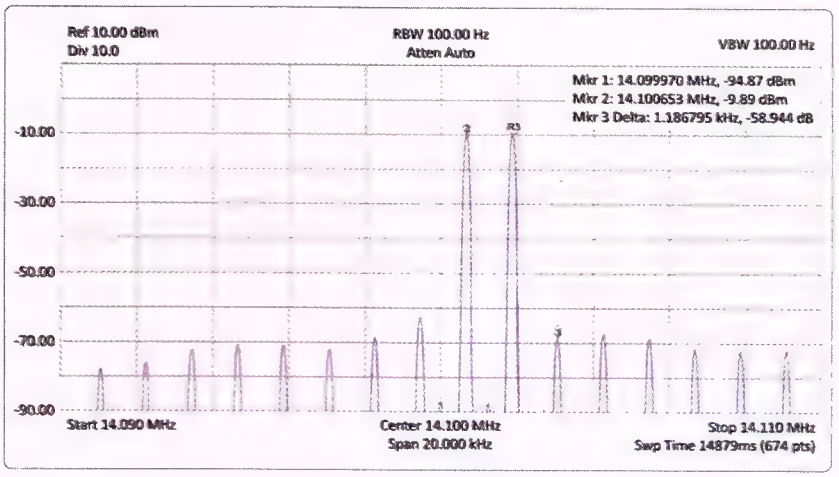


Figure 4. IMD results for 20 metres, with PureSignal ON – 10 Watt output.

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Ross Hull & the Selden Hill Gang

¶ *Charles Dubé, W1LCD*

In 1930s rural Connecticut, driven by the spirit of art deco, this indomitable Australian led a technology incubator that spawned seminal principles in VHF circuitry and propagation

The house still stands, though I'll wager few of its neighbours have any more than a dim awareness of the commotion that was once contained within its old walls. Some may recall that a group of 'hams' once occupied the place, overrun it – if you believe the accounts. For in the mid-1930s, a small team of experimenters traded their work and leisure hours to explore the nature of newly available radio frequencies.

They did some spectacular work for the day. Radio in this period was still an experimenter's sandbox; experimenters were striving for higher and higher frequencies that would one day be used in broadcast radio and television, commercial, military and municipal radio systems.

Ross Hull was a VHF frontiersman, exploring the technologies and techniques necessary to exploit the new frequency bands allocated to amateurs.

The new frontier

In the early decades of the 20th century during the upsurge of the radio industry, an understanding of the effects of the atmosphere on radio signals was in its infancy. The convention was that signals on frequencies now considered shortwave – wavelengths shorter than 200 metres (or about 1500 kHz on up on your AM dial) – were useless for most purposes. The lower the frequency (longer wavelengths), the more valuable it was to commercial and naval interests.

The Radio Act of 1912 (USA) forbade any private stations from operating on wavelengths longer than 200 metres and prior to 1923, amateur radio operators could only get a license for 200 metres, with a few obtaining a second license for 175 metres [1]. It was a recipe for an enormous amount of interference, with signals clustered on the same slice of turf.

Transmitters were primitive and unruly, lacking stability and economy of bandwidth. Long distance communication on 'shortwaves' was thought impossible because of the presumed inefficiency of the components and antennas at those frequencies. Engineers calculated that an exorbitant amount of energy had to be generated for any real communication to occur. So, these frequencies were disregarded by industry and the military as useless.

The challenge was to design and build transmitters and receivers capable not only of operating in the new territory, but also ones that would possess real stability. Engineers and hobbyists alike battled to push the state of the art, operating on higher frequencies, over time innovating circuit designs and making contacts at greater geographical distances.

The 1920s saw a flurry of activity with communication between points around the country becoming common. By 1923, a new band was created for amateur radio operation between 150 and 220 metres (roughly 1400 kHz up to about 2 MHz on your AM dial). The Atlantic Ocean, already conquered at the longer wavelengths, was the next great hurdle.

In November of 1923, this barrier was breached, and astonishingly, at the 'useless' wavelength of 100 metres, with contact between stations in West Hartford, CT (USA) and London, England. Over time, as the number of international contacts grew, engineers and the regulators

¶ *This article appeared previously in the October 2020 issue of The Spectrum Monitor, www.thespectrummonitor.com. All photographs, excepting Ross Hull's portrait, are courtesy of the American Radio Relay League (ARRL).* *Charles Dubé is currently Chief Engineer for New England Public Media (Western Massachusetts radio group) and has worked at many radio stations in the Hartford, CT and Springfield, MA areas. He has been a licensed amateur since 1988 (ex-KA1SKG) and holds an Extra class amateur licence in addition to a Certified Professional Broadcast Engineer certification from the Society of Broadcast Engineers.*

began to recognize that these shorter wavelengths had merit and new bands were opened up for amateur radio experimenters to come up with circuits that could use them.

The value of 'amateur' technical development didn't exactly go unnoticed, however; the military, along with commercial interests, sought out skilled operators and designers for their own purposes. This created something of a symbiotic and competitive relationship between interest groups.

During the First World War, many radio operators came from the pool of radio amateurs. Later, some of the first AM broadcast stations started out as experimental amateur radio stations [2]. The now 100-year old WWJ in Detroit started out as amateur radio station, 8MK.

By the end of the decade, investigation into wavelengths as low as 10 metres, unthinkable just a few short years before, created new excitement in the amateur radio community. Using new crystal oscillators and other precision components allowed for smaller and smaller wavelengths by the early 1930s.

While the technology race was happening in the US, it was also happening elsewhere in the world, from Europe to the distant beaches of New Zealand and Australia. It was in Australia that a young architecture student by the name of Ross A. Hull set aside his studies to pursue a passion for wireless. Hull, already an Honorary Secretary to the Wireless Institute of Australia, was the first of his fellow citizens to hear the distant rhythms of American signals, amongst others.

In 1925, a chance meeting with an American, American Radio Relay League (message) Traffic Manager Fred Schnell – credited as being the American half of the first transcontinental amateur radio contact – convinced Hull that a trip to the United States was in order [3]. In 1926, Hull booked his passage for America, soon finding himself at the doorsteps of the American Radio Relay League (ARRL,) the predominant American amateur radio organization. In a fortunate turn of events, they had a position open.

The Gang and the bootlegger down on the farm

Located in a bucolic setting in West Hartford called Buena Vista, with an at-one-time panoramic view of Hartford, sits Selden Hill. Here rests a mid-19th century farmhouse on property settled by the original Selden family in 1785. By the 1920s, the house was occupied by Mr Henry Selden, his wife Sarah, and their seven children. Together, they operated the dairy farm and a mill constructed by Henry, complete with horse-drawn lathe, repair and blacksmith shop.

The property seemed to be the ideal environment for the tinkerer

Photo 1: Selden Hill House (from QST, August 1944).

and the entrepreneur. In addition to the farm, around the turn of the century, Henry and his sister-in-law owned the Selden Ice Cream Parlor at the intersection of LaSalle Road and Farmington Avenue in West Hartford Center. It was a short-lived venture.

Years later, in 1931, the American Radio Relay League would build its new headquarters just down the road at 38 LaSalle Road, long after the parlor shut its doors. Henry had long since focused his efforts on the farm and his family [4].

Ross Hull decided to extend his stay in Connecticut honing his technical skills, and eventually took the helm of the ARRL's newly formed Technical Development Program. With his team, the Program improved on circuit design and construction practices, and improved stability, and came up with new ideas for frequency measurement, antennas, monitoring devices, and other advancements of the radio art.

During this time, Hull is credited with rewriting the League's 1928 ARRL Handbook, the authoritative reference book for radio construction, theory and operation. Hull remained in the United States for almost three years, departing after the conclusion of the Technical Development Program in 1929 (and perhaps because of an expiring work visa). He returned home to become the technical editor of Australia's Wireless Weekly [5].

Connecticut's allure eventually proved insatiable and in about 18 months, Ross Hull was once again headed back to the United States aboard the MS Ward in August of 1930, to accept the position of Associate Editor at QST magazine – the ARRL's monthly publication.

In the early months of 1931, the League established its new headquarters in West Hartford and several of its staff members went looking for adequate boarding nearby, preferably somewhere with a height advantage, trees and yard space for the construction of antennas.

While exploring the town, Hull, VK3JU and QST managing editor Clark Rodimon, W1SZ spotted a 'Rooms For Tourists' sign at the foot of the hill. The two wasted little time in convincing the matron of the house that tourists would no longer be necessary as they could happily fill the vacancy for a good duration.

Rodimon, or 'Roddy' as he was called, thought the site preferable because of his interest in contesting, where operators compete to accumulate the most contacts in specific categories [6]. Hull found the farmhouse's high location favourable for UHF. The frequencies then used are today referred to as VHF; and even shorter wavelengths took the label of UHF in later years as technology progressed.

By July, Hull published his first article detailing his accomplishments in UHF receiver evolution, in QST. Rodimon soon left the bachelor life at Selden Hill, leaving to marry. The results of his work along with that of Hull's and the others boarded there, established something of a reputation in the amateur radio community regarding Selden Hill, and the occupants became known as "The Selden Hill Gang".

In 1932, regular testing of UHF receivers, transmitters, and antennas was in full swing. A parade of amateur radio operators rotated through Selden Hill and within a few years, the site hit its stride with Hull's ground-breaking UHF contact between West Hartford and Boston on the 56 MHz (or 5 metre) band (note the ever-shrinking wavelengths).

During a visit to Provincetown, Hull and company examined New

Photo 2: Hull's 56 MHz directional antenna of wire and wood was used in his seminal work on demonstrating tropospheric refraction propagation.

England Telephone's radio link across Cape Cod Bay to Brant Rock, which inspired The Gang's construction of sophisticated antennas with gain. Hull's version allowed for an effective but not consistent 100-mile signal path to Boston. The Boston stations at first refused to believe that Hull was in Connecticut, exclaiming how they were going to 'unmask that bootlegger' [7].

Months later, Hull recreated that accomplishment on the higher frequency of 112 MHz using his newly-designed receiver and directional antenna; what Henry's daughter, Rilla Selden called the "big contraption" [8]. The revolutionary beam antenna design was shared in the October 1934 issue of QST, encouraging others to jump into the game.

At the Selden home, another radio enthusiast would soon join The Gang. In 1935, Byron 'By' Goodman, W1JPE, left San Francisco and a gig at the radio manufacturer Remler to venture east to become the assistant secretary to ARRL Secretary, Kenneth B. Warner. In California, Goodman was an early explorer of 29 MHz (now part of the 10 metre band), later furthering single-sideband technology that would eventually become a key method of analogue communications in amateur, military, marine, and other high frequency (shortwave) applications [9].

Wave bending and sky riding

The pace established in the early days of UHF exploration continued at Selden Hill throughout the mid-1930s. After his historic connection with Boston, Hull oversaw a round-the-clock cycle of operators to continue making contacts using a 200 W oscillator on the 5 metre band and charted the results.

The data culled from these experiments was compared with weather data, temperature, barometric pressure and lunar cycles in order to answer the question of why successful contacts on these frequencies were highly inconsistent. The idea that radio waves are 'bent' under particular atmospheric conditions, that they become trapped and 'ducted' long distances between cold and warm air masses, came from these efforts [10].

Photo 3: One of the "contraptions", a beam antenna used by the Selden Hill Gang.

An important project was performed in conjunction with Harvard's Blue Hills Observatory using a signal strength recorder of Hull's own design that employed ingenious and complex photographic techniques to record received signals from Boston on a regular schedule [11]. Some contemporary newspaper accounts indicate that experiments in predicting severe weather might have been part of this experiment.

Being something of a Renaissance Man, Hull took pleasure in entertaining the residents of Selden Hill with his talents at the piano, quiet moments painting and sketching (the August 1944 issue of QST features his linoleum block cut of the Selden Hill House), astronomy, photography, literature, and experimenting with another passion – model aircraft, for which he had developed quite another formidable reputation. In the summer and fall (autumn) of 1937, for example, he made over 100 experimental flights [12].

Hull's model aircraft experiments led to his developments, along with fellow amateur Roland B. Bourne, W1ANA, in radio-controlled 'sailplanes' – the precursor to what we now know as drones [8]. In the age preceding transistors and integrated circuits, it was no easy feat to construct a successful flying device carrying a payload of tubes and the batteries to power them.

The steep slope of Selden Hill allowed for many weeks of joyful experimenting. QST and radio controlled modeler magazines of the time, both in the US and Australia,

Photo 4: "That day was counted that did not see a new antenna raised", said Cyrus Read in his book, The Legend of Selden Hill [6].

featured articles on these designs and tales of successful flights. In 1938, Bourne's and Hull's radio-controlled model aircraft, called *The Skyrider 1*, flew at the National Soaring Contest at Elmira, NY. The presentation contained a number of features, including reversible DC motors and the piping of the pilot's (Bourne's) chatter into the public address system [13]. All of this was done in addition to Hull's regular work at the League as QST Associate Editor, which began to include work in early television circuits.

Technology continued to move at a rapid pace and the buzz around television was in the air. RCA engineers, along with NBC, had established an experimental television station, W2XBS, at the Empire State Building in New York City (NYC), some 100 miles-plus distant from the rolling hills of the Hartford suburbs.

Hull, who eventually built his own amateur television transmitter at the ARRL laboratory to explore its potential for amateur use, was at first put off by what he saw as false promises from the industry. However, by 1937 his interest in television was stirred and he set out to construct a superior receiver using RCA's new cathode ray tube. He surprised RCA engineers with his claims of receiving W2XBS's transmissions from NYC, proving once again that UHF signals could indeed reach in excess of a presumed 50 mile limit.

Echoes of a conspicuous era

After almost a full decade of innovations and development in the radio arts, in June of 1938, Ross Hull finally left Selden Hill to the others, the vacuum soon filled by those keen on the advantages of the property for contesting, research into single-sideband transmission, and other technical advances.

Selden Hill remained a home to hams for a while longer – unofficially the ARRL's 'annex' laboratory. Hull moved to take up residence in the quiet suburbs of Vernon, CT where he continued his experiments in television that were to envelop the last six months of his life.

September 13, 1938 proved to be the most fateful of days. After hosting a small dinner party, Hull offered his guests a demonstration of his television receiver; the NBC experimental transmissions were about to begin. Dismissing himself from the table, he slipped off to his garage laboratory to prepare his equipment.

Placing a set of headphones on to listen for the audio component of the signal from NYC, he reached under the bench to plug in the power supply. With the supply now energized he pulled his hand back from under the bench, but in doing so came into contact with a 6000 V lead of the supply's transformer. The headphones completed the circuit to ground and Hull was instantly electrocuted.

One of the dinner guests was a doctor and he made an immediate attempt to resuscitate Hull. Soon, medical assistance arrived at the residence to administer adrenaline, but all efforts failed [14]. Hull was just 36 years old. A few feet away, in scattered papers on his workbench, was an unfinished article he was working on for QST. The topic – the dangers of working around high voltages.

Through the end of the 1930s up to the war years, work continued at Selden Hill by others from the ARRL Headquarters staff. Experiments were done for articles to be published in QST. And for many years, visitors came from around the world to experience the lab along with the Selden Hill hospitality.

Although I have driven by the neighbourhood scores of times in my travels throughout West Hartford, it

wasn't until recently that I reflected upon the historicity of this once quiet haven for tourists. I cannot help but wonder if any reminders still exist: an insulator fastened to a corner of the house, a nail stuck in one of the trees that once helped to cast signals hundreds of miles, perhaps initials carved into a door frame.

It's intriguing to learn that a place that seems so modestly 'New England' was the site of such bustle in a different era. In preparing this little narrative, it was a pleasure to become acquainted with a man who packed so much life and legacy into his few but kinetic years as the sage of the Selden Hill Gang, along with the others who, in their unique ways, contributed to make radio what it is today.

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Special thanks to Maty Weinberg and Becky Shoenfeld at ARRL, John Ramsey and Chris Tracy.

Silent Key

Leith Martin VK2EA

23 02 1924 – 22 11 2021

After 97 good years Leith Martin VK2EA became a Silent Key in the early hours of Monday 22 November 2021.

Leith was born in 1924 the same year as Yagi and Uda began working on the now ubiquitous Yagi antenna and the Mount Stromlo Solar Observatory near Canberra was established.

Leith's Amateur Operator's Certificate of Proficiency is numbered 169 and dated 15 May 1947.

He was first issued an "Experimental Licence" which was replaced by his Amateur Station Licence Number NA 96 with call sign VK2EA on the 13th June 1963 and held that licence ever since.

We believe that at 21,697 days or 59 years 4 months and 25 days, Leith was the longest continuously licensed Amateur in Australia.

Leith was a life member of both SARC and Wicen; accolades for his decades of dedication and tireless service to Amateur Radio and the community.

Leith is survived by his wife Shirley. While they have no biological children, the nurturing and mentoring so many of us received will live on for generations to come.

73 OM, TNX for FB QSO's

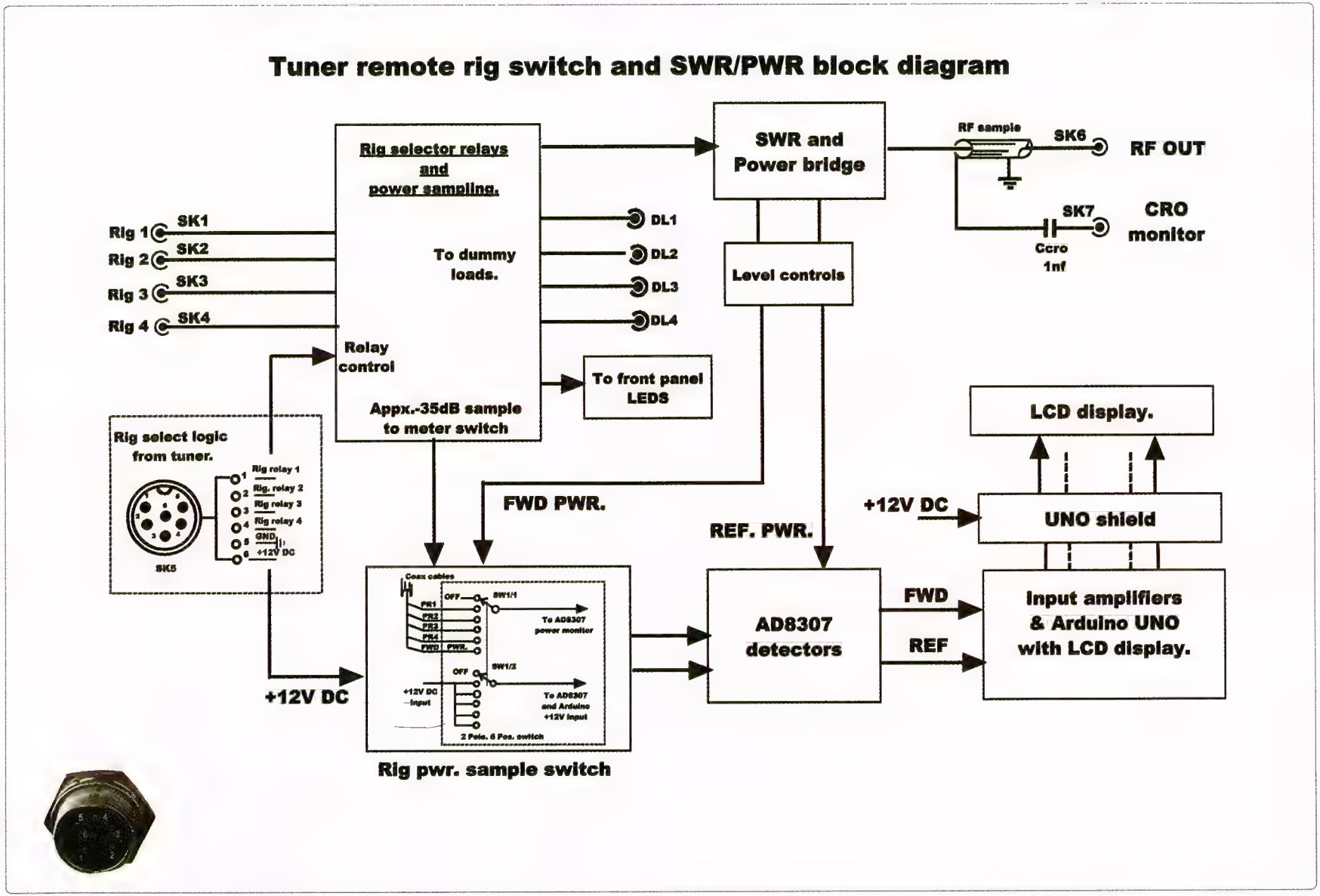


Figure 10. Rig block diagram.

The VK3AQZ HF antenna tuner project

Part 2 Fourth article of Lou's ATU project

Luigi Destefano VK3AQZ

2. Rig selector, power and SWR meter

2.1 Rig switch

Here is a block diagram of the rig switch (**Figure 10**) and a view of the completed unit – **Photo 2A1.**

This unit contains four relays for selecting one of four rigs. It also contains an SWR sensor, power meter, and an Arduino UNO processor for performing calculations and display.

I have provided for four rigs to be connected to the coupling unit via relays driven from the main unit.

Reference	Value	Notes
	Labels to suit.	
SK1 - 4,6	5 off SO239 chassis mount	
SK7	1 off BNC female chassis mount	
SK5	1 off 6 pin chassis mount male mic connector.	
Dummy loads	4 off Microwave terminating resistor 250W	
	Type RFP 250N50 250w or similar	
	Each dummy load with SMA female chassis connector.	
Heatsink to suit the dummy loads.		
Metal case to suit.		

Parts for Fig 10 Remote rig Enclosure.

The relays are switched by the main coupling unit via the shielded 6-core cable. **Figure 12** shows the relay switching circuit (*this is not a numbering error* – Ed. Figure 11 appears later).

There is a small potential problem when you have four radios and only one can be connected to a load. What happens if you accidently key up one of the others and it sees an open circuit? Some rigs will protect themselves and power down, but others can blow up! So, in this design I have used the normally-closed contacts to connect each rig to a 50 ohm, 250 W dummy load, mounted on an aluminium heatsink on the lid of the case, as in this photo (**2B5**).

I used Port A of the ATmega 2560 IC to control four rigs and four antennae. In this case, I just activate the PA0 to PA7 pins individually. The four rigs are switched by PA0, 2, 4, and 6, and the four antennae by PA1, 3, 5, and 7. The reason for that is the way these pins are placed on the Arduino shield. The even-numbered pins form four header pins in one straight line and the same applies to the odd-numbered pins. Essentially, the eight pins that make up Port A comprise two header rows down one side of the PCB. I connected to the odd pins with a straight 4-pin plug and 4-way ribbon.

Photo 2A1. A view of the completed Rig Switch.

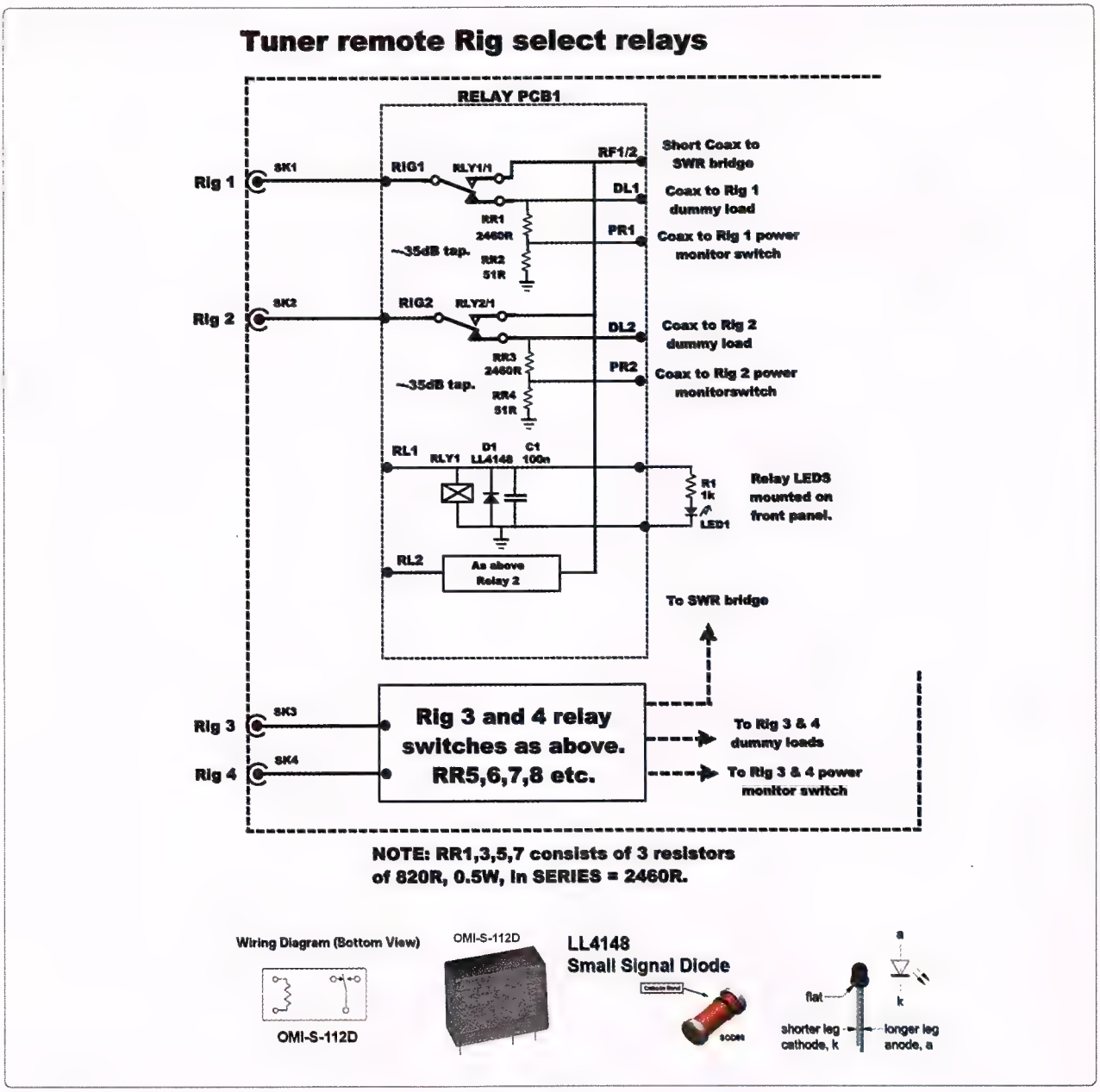


Figure 12. Relay switching circuit.

Reference.	Value	Notes.
C1,2,3,4	100nf	SMD across relay coil under PCB
D1,2,3,4	LL4148	SMD across relay coil under PCB
LED1,2,3,4	3mm LED	Mounted on LED PCB on front panel
R1,2,3,4	1k 0.5W	Mounted on front LED PCB on front panel
RLY1,2,3,4	SPDT 12V 10A relay	OMI-S-112D or similar.
RR1,3,5,7	3 x 820R 0.5W	3 off connected in series measured to 1%
RR2,4,6,8	51R 0.5W	
NOTE: 2 PCBs with 2 relays on each mounted upside down in case.		

Parts for Fig 12 Tuner remote rig relay switch circuit.

Two PCBs, with two relays each, are mounted upside down near the SO-239 rig connectors. The switched outputs of the relays feed the SO-239 output connector via a Stockton-type SWR and power bridge.

The relays I use here are different from the ones in the coupling unit. Two of these are shown on one PCB in the **Photo 2A2**. These relays have all three switching contacts at one end of the case making the internal conductor lengths short.

The type used in the coupling unit have the moving pole at the opposite end of the case, away from the NO and NC contacts. The moving pole conductor is part of the metal that is pulled by the coil and is longer than in the relays used here.

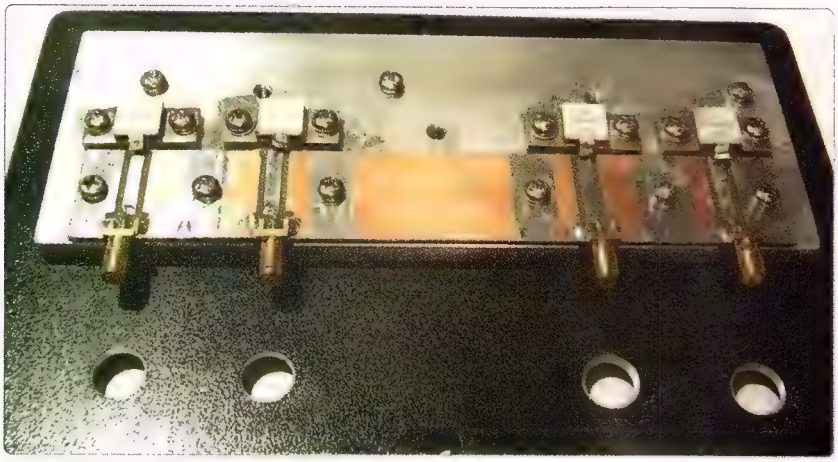


Photo 2B5. Dummy load assembly.

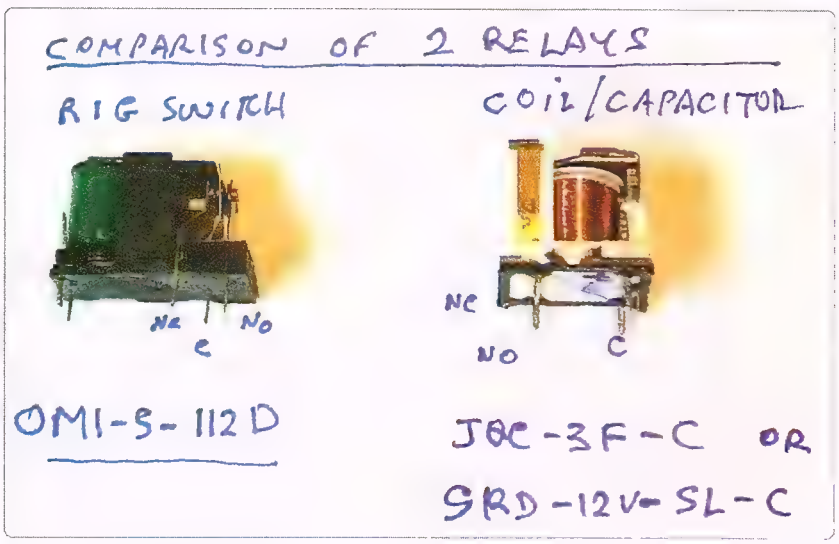


Photo 2A3. Difference between relays.

See **Photo 2A3** for the difference between the two types of relays.

I use the OMI-S-112-D that is rated at 10 amps AC/DC with a coil resistance of around 200 ohms. [This relay is no longer available. Lou says that any relay with a similar form factor and contact current carrying capacity will do – Ed]

2.2 SWR and power meter

See **Figure 13** for the circuit of the Stockton Bridge and **Figure 14** for the AD8307 detectors.

The SWR and power meter consists of a Stockton Bridge feeding a pair of AD8307 detectors. The outputs of the detectors feed buffer amplifiers that drive two analogue pins on the processor. The AD8307 DC output level is a log function of the input voltage. So, input voltage changes produce output changes directly in dB. The AD8307 ICs I chose have intercept point and slope adjustments.

I tried FT-50-43 cores for the bridges based on a web design and found they had poor directivity. I had used FT-50-61 cores on my homebrew rig and they worked well. So I replaced the 43 cores with the 61 cores and the directivity was much better. At 7 MHz, directivity was 27 dB, falling to 15 dB at 28 MHz.

David Stockton G4ZNQ got a directivity of around 23 dB, but made no mention of frequency or power levels. I started to see core saturation at 28 MHz with a 100 W signal. A 100 W signal at 28 MHz read 70 W. The same power setting read 100 W into a dummy load that was not connected to the bridge. At 7 MHz, the bridge and meter combination produced a reading of 100 W for a 100 W signal. At 21 MHz, the same level read 88 W, and at 28 MHz, it read 70 W.

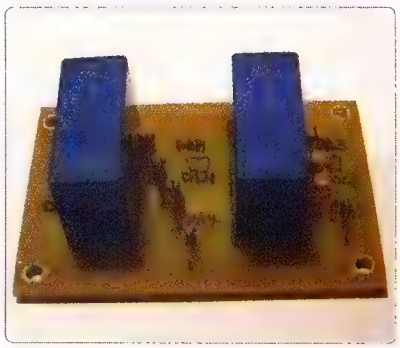


Photo 2A2. Two of the four relays.

I did try a Warren Breune single core bridge, but a trimmer needed tweaking, and it also was poor using the 43 material. I suspect the poorer directivity of the bridges at the higher frequencies is because of stray coupling around the PCB and case. In some designs, the cores are separated and shielded, so that might be an answer.

For the power and SWR meter, the processor analogue inputs are converted to a digital value using a processor internal reference of 5 V. You can use an external reference but you need to be careful that any external voltage on the external reference pin is delayed until the software has finished assigning that pin as the reference. Applying an external voltage to the pin prior to the setup command, may destroy the processor. So, I have avoided that approach and settled for slightly less accuracy.

I have written a short sketch for converting the detector signals to power and displaying the SWR. The program is called 'AQZ Tuner SWR PWR meter.ino' and will be available for down-load from my website.

The outputs of the AD8307 detectors feed LM358 op-amps that I built on a small homemade shield that plugs into a UNO shield that in turn plugs into the processor. See

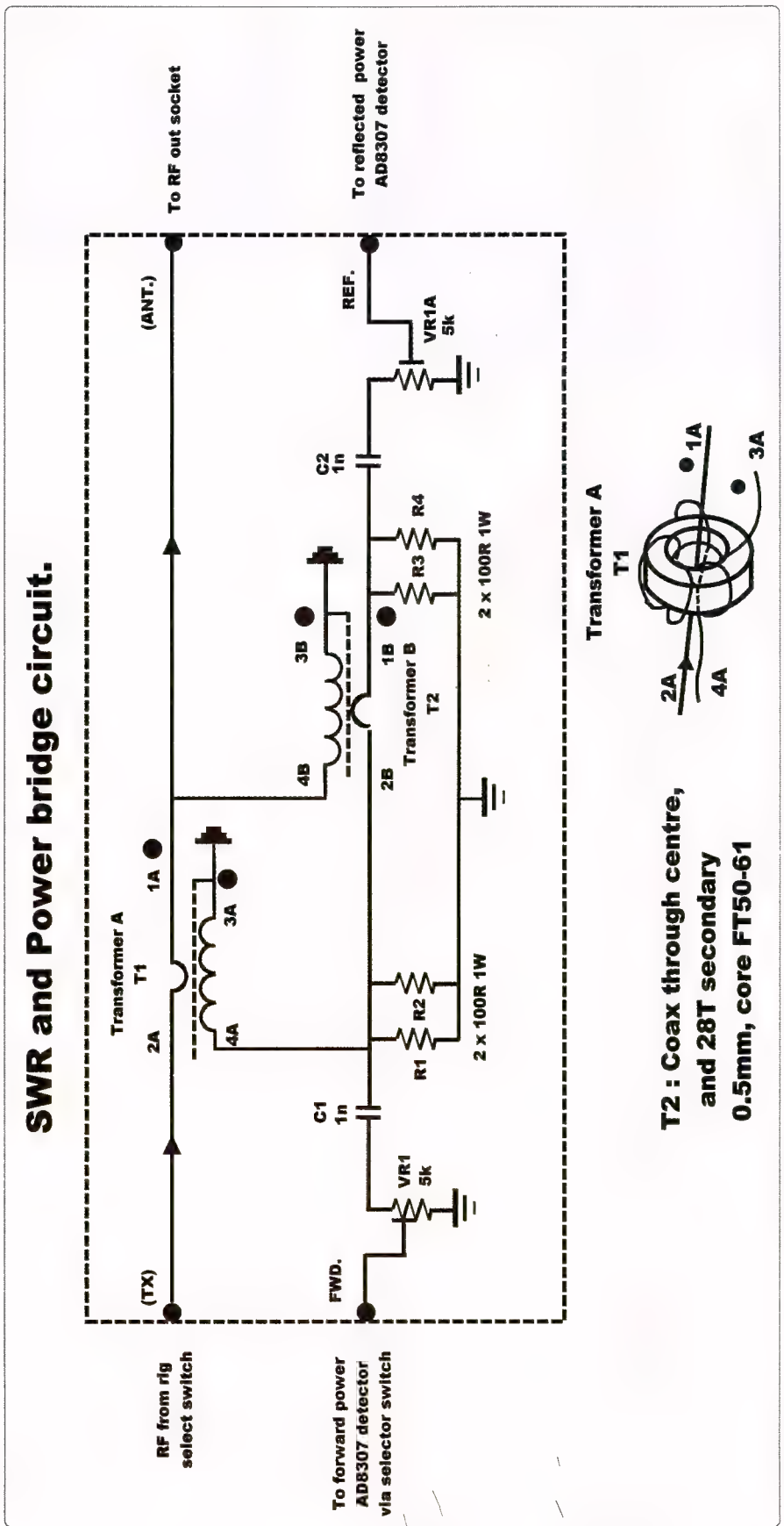


Figure 13. Circuit of the Stockton Bridge.

Reference.	Value	Notes.
C1,2	1nf	Ceramic disc.
T1,2	Stockton coupler	Teflon/PVC covered shielded wire through FT50-61.
		28T, 0.5mm, Enm. wire secondary.
		Electric shield over primary wire, earthed one end.
R1,2,3,4	100R, 1W	
VR1,2	5k trimpot.	

Parts for Fig 13 Tuner SWR, power and Stockton bridge circuit.

Figure 15 for the circuit of the LM358 op-amps and **Photo 2B3** for the board. See **Figure 16** for the processor circuit, and the parts that are mounted on the shield.

See **Photo 2B4** for the UNO shield I purchased on the web; it has an array of pins for LCD displays. It has the word 'Keyes5.1' on it, and has provision for a 5 V regulator, bypass capacitors and contrast controls. I also added a small trimpot for backlight brightness. I used it to connect the 16x2 display, and feed power to the processor via the 5 V regulator.

The shield has female headers on top that I use to power the LM358 op-amps and connect it to processor pins A1 and A2. Forward power and reverse power voltages from the AD8307 feed the input of the two op-amps in the LM358; trimpots adjust the gain to give a final detector slope of 30 mV/dB. The forward

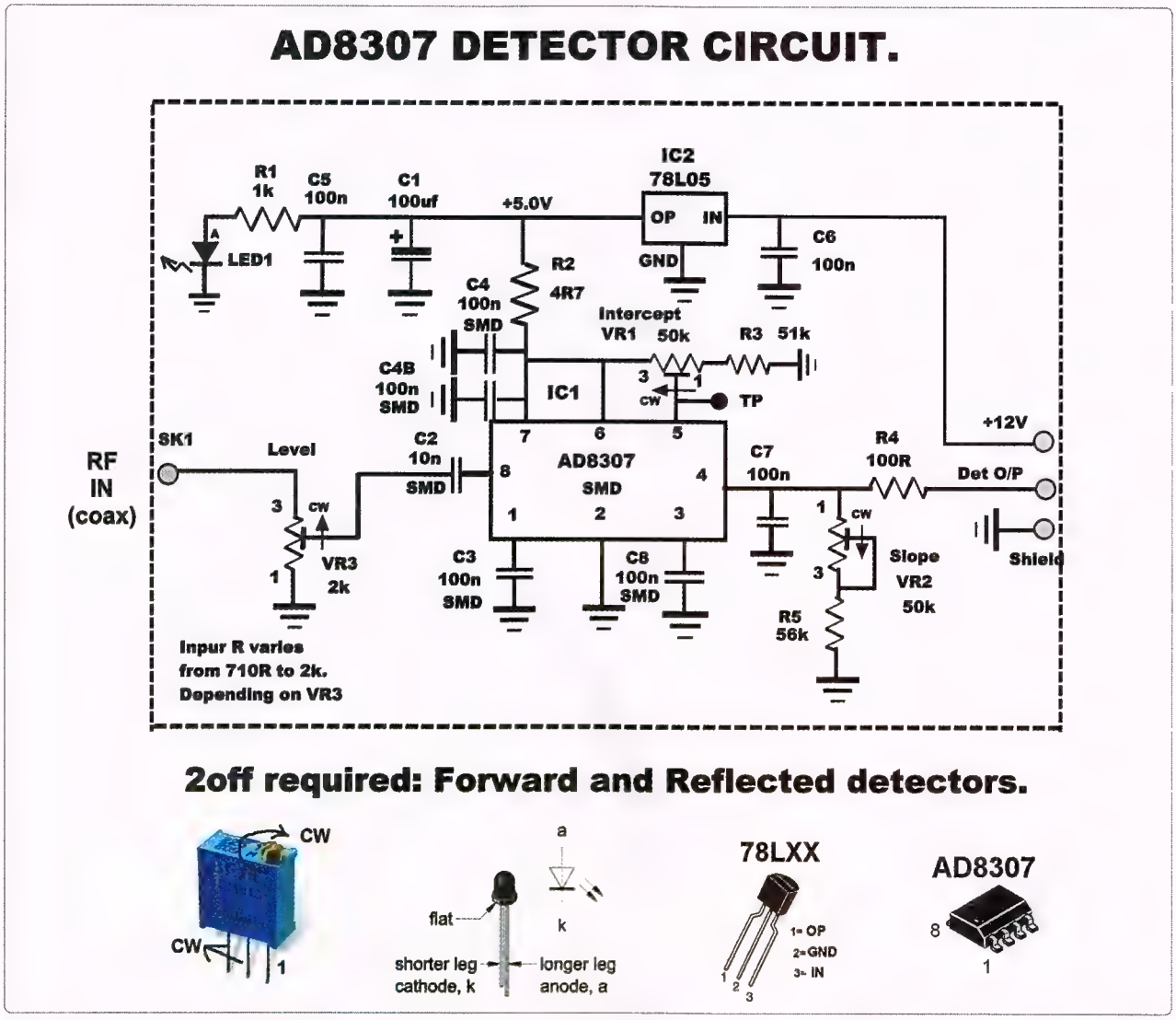


Figure 14. Circuit of AD8307 detectors.

Reference.	Value	Notes.
C1	100uf 16V	Electrolytic
C2,3,4A,4B,7,8	100nf	SMD
C5,6	100nf	Monolithic
IC1	AD8307	SMD
IC2	78L05	Regulator
LED1	3mm LED	
Matrix pins	6 off	1mm pins
R1	1k 0.5W	
R2	4R7 0.5W	
R3	51k 0.5W 1%	
R4	100R 0.5W	
R5	56k 0.5W	
VR1,2	50k trimpot 20 turn	
VR3	2k trimpot 20 turn	

Parts for Fig 14 Tuner each AD8307 detector circuit. There are 2-off.

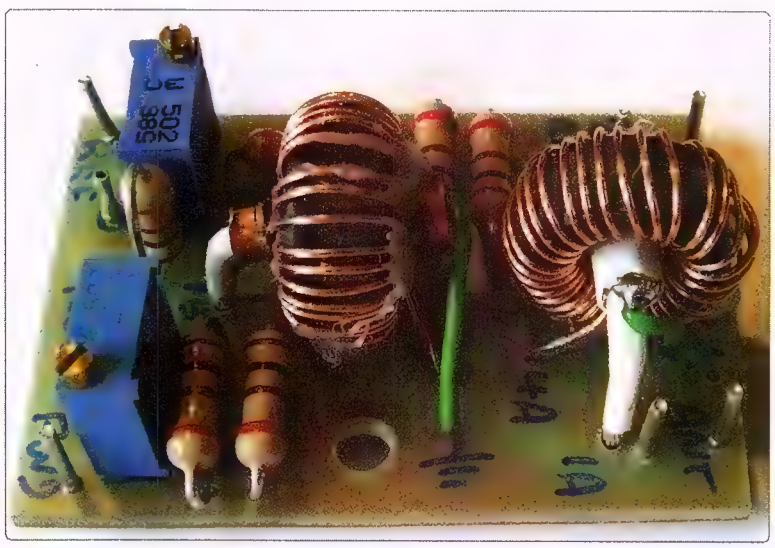


Photo 2B1. The Stockton Bridge board.

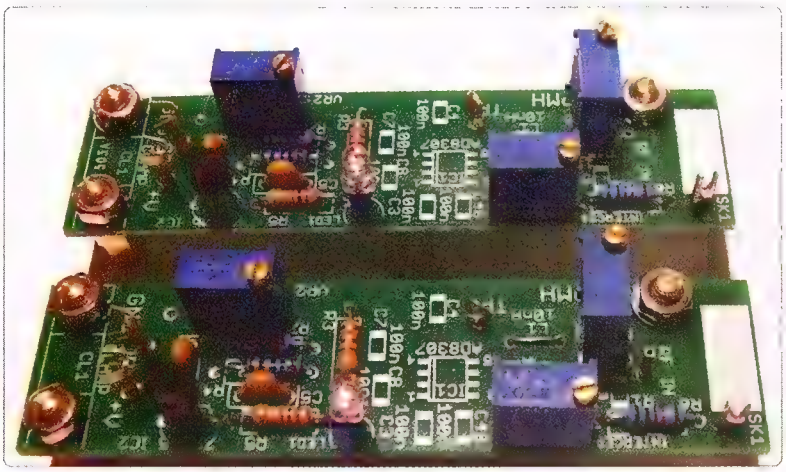


Photo 2B2. AD8307 detectors.

power and reverse power detectors need to be set up with the same slope and intercept point by feeding the same signal into both detectors.

Using the AD8307 detectors simplifies the programming. The AD8307 output is a log function of the input voltage. This allows some simple formulae in the software to convert the detector voltages to relative power in dB. The dB values can be read as absolute power by inserting the AD8307 intercept point value and slope into the program equations. I have added comments to the sketch that detail the variables you need to change for different values of slope and intercept.

Because of the limited resolution of the processor analogue to digital (A/D) converter, the displayed values will jump several fractions of a dB.

However, it is accurate enough for this application. Essentially, the main use of the power meter is to check the action of the tuner in reducing the SWR.

The forward power detector input is connected to one moving pole of a two-pole, six-position rotary switch mounted on the front panel. See **Figure 11** for the switch wiring (*this is not an error in numbering* – Ed.). The switch has two poles; the other pole turns off the SWR and power meter section of the unit. So, on position 1, only the relays are active since they are driven by the signal voltages from the coupling unit. Everything else only comes on when the switch is in positions 2 to 6.

The four dummy loads have resistor taps across them. The outputs of the taps would normally be -40 dB, but in this design, the load is not 50 ohms across the 51 ohm resistor in the tap. It is more likely to be around -35 dB, since I have not terminated the AD8307 inputs with 50 ohms.

The outputs of the four taps go to positions 2 to 5 of the selector switch, and the RF output from the forward power connector on the bridge goes to position 6. These signals are switched to the input of the forward power AD8307

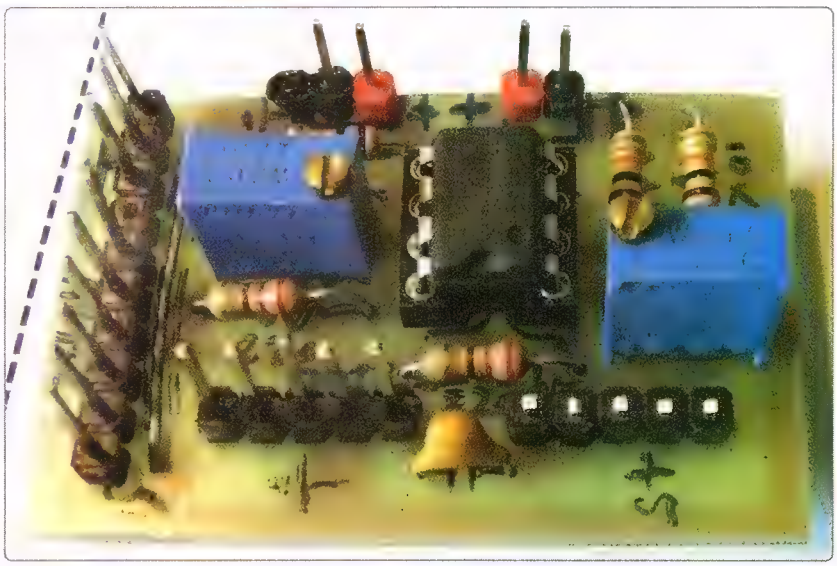


Photo 2B3. The op-amps board.

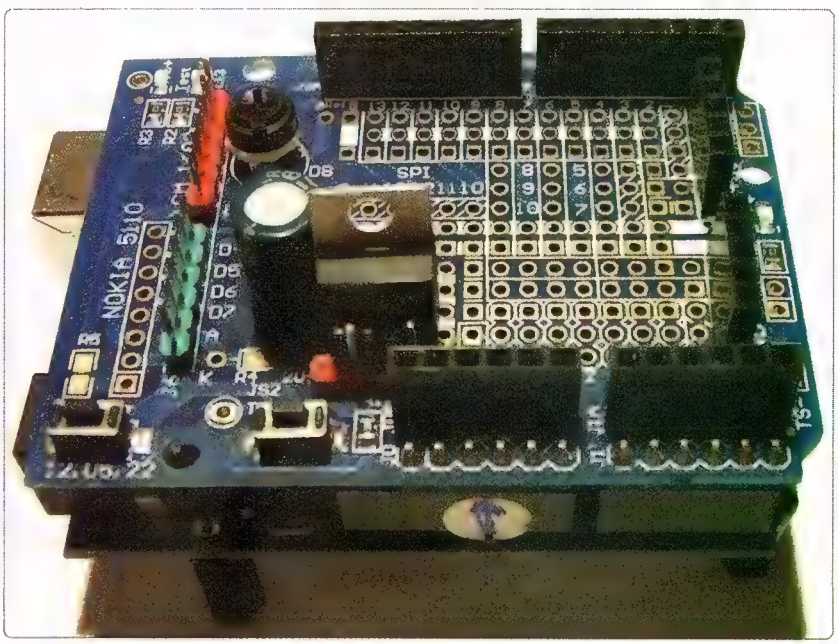


Photo 2B4. UNO shield.

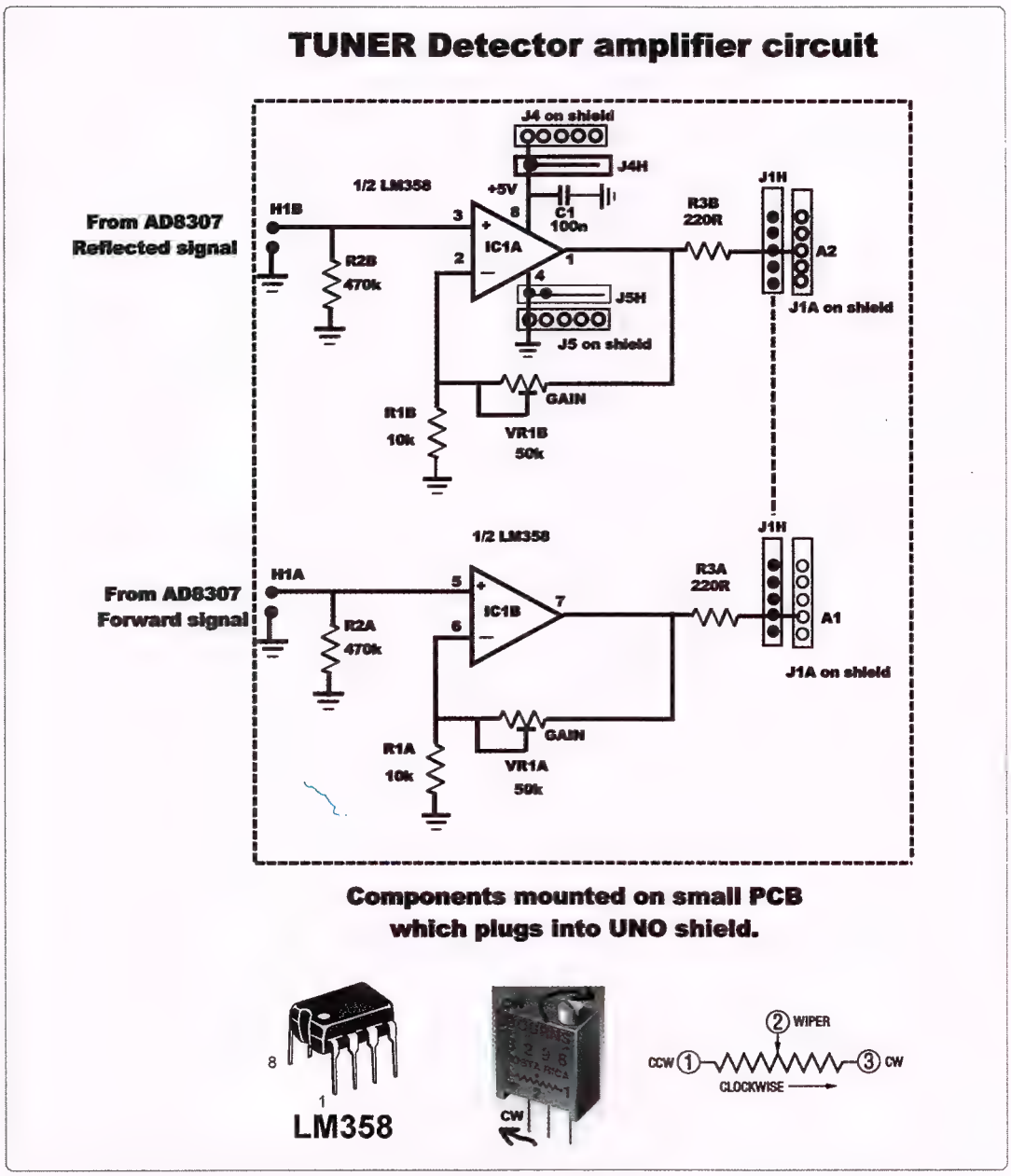


Figure 15. Circuit of the LM358 detector amplifiers.

Reference.	Value	Notes.
C1	100n	Monolithic ceramic
IC1	LM358	Dual OP amp.
J1H	10 way header	Long Centered, male, 0.1"
J4H,5H	5 way header	Long Centered, male, 0.1"
H1A,H1B	2 pin header	One pin Black (0V) and one pin red (input).
R1A,1B	10k 0.5W	
R2A,2B	470k 0.5W	
R3A,3B	220R 0.5W	
SK1	8 pin IC socket for IC1	
VR1A,1B	50k trimpot 20 turn	

Parts for Fig 15 Tuner detector amplifier circuit.

detector that in turn feeds the processor via an LM358 op-amp. The processor then displays the result of the input voltage in terms of dBm and Watts.

The three rigs not going to the tuner are each terminated in a 250 W, 50 ohm load, and can be tested for output power. The result can be read on the display by switching to the tap associated with that load. The power level of the rig going through the bridge can also be displayed by switching to the 6th position of the metering switch. The bridge contains output trimpots to match the bridge output voltage to that from the taps.

The inputs of both detectors also have input level adjustments to match the two detectors

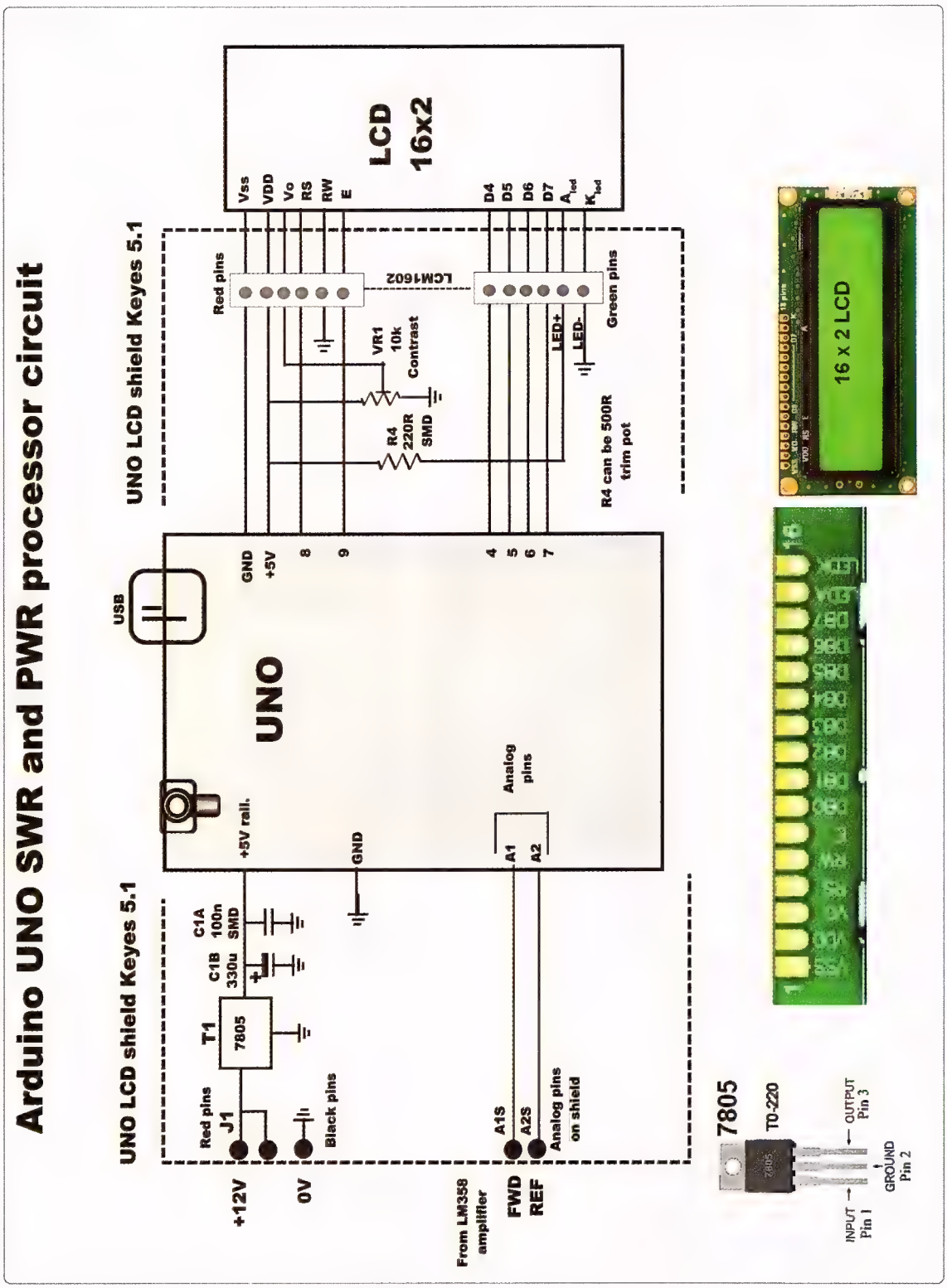


Figure 16. Processor circuit.

for sensitivity. You need to make all these adjustments with known power levels. The slope adjustments require two known power levels. For example, with 10 W and 100 W, the power change is 10 dB. The slope of the signal at the AD8307 outputs is adjusted to 20 mV / dB. So a 10 dB input signal change should see a 200 mV change at the output of the AD8307.

This signal is then further boosted to 30 mV / dB by the LM358 op-amps. So a change from 10 W to 100 W should see a 300 mV change at the processor input pins A1 and A2. The maximum output from an LM358 is around 3.7 V with

Reference.	Value	Notes.
Main processor	ArduinoTM UNO R3 or similar	
Arduino™ UNO LCD blank shield Keyes 5.1 type		
LCD display	16x2	To suit Arduino, HD44780U or similar
C1A	100n	Monolithic
C1B	330uf 16V	Electrolytic
2 off 6 way Female - Female cable from UNO Shield to LCD.		
T1	78M05	Or 7805
LCD Headers	1x6 pin headers to connect to display pins red	
	1x6 pin headers to connect to display pins green	
J1	3 pin male PCB header	Red for power in
VR1	10k	Contrast
R4 Backlight resistor can be appx 220R or a small 500R trimpot.		
Remote rig Enclosure		
Case	Diecast box 190 x 120 x 60 mm, plus stick on rubber feet	
	Labels to suit.	
SK1 - 4,6	5 off SO239 cahassis mount	
SK7	1 off BNC female chassis mount	
SK5	1 off 6 pin chassis mount male mic connector.	
Dummy loads	4 off Microwave terminating resistor 250W	
	Type RFP 250N50 250w or similar	
	Each dummy load with SMA female chassis connector.	
Heatsink to suit the dummy loads.		

Parts for Fig 16 Tuner Arduino UNO SWR and PWR processor.

a 5 V supply rail.

The processor maximum analogue input level is 5 V when using a 5 V reference.

The processor divides the input signal by 1023 and assigns that result to a variable. The value in the variable then represents the analogue input voltage. So each volt is divided into 204.6 parts. This represents a minimum resolution of around 4.89 mV (1 V divided by 204.6). That is as accurate as we can get with the processor A/D. If we have a slope of 30 mV / dB, we cannot get any reading less than 4.89 mV. So, if 1 dB equals 30 mV, it can only be resolved down to around 6 parts or 0.163 of a dB (ie, 30/4.89).

If we have an input that goes from 10 W to 100 W, with a slope of 30 mV / dB, the input to the processor will only change by 300 mV. You could use a greater slope, but that will limit the overall range of the meter. I have set the sensitivity so that a 100 W signal produces a 3 V signal at the processor input. A 10 W signal produces a 2.7 V signal, and a 1 W signal, a 2.4 V signal. So there is scope for a better resolution. A 400 W signal is still within the range of the meter, as is a 1000 W signal (providing nothing else blows up!). And a 0 dBm, or 1 mW, signal is also readable. A 60 mV / dB setting would give a better resolution and is worth considering.

Because of the limitations of the conversion process and low slope

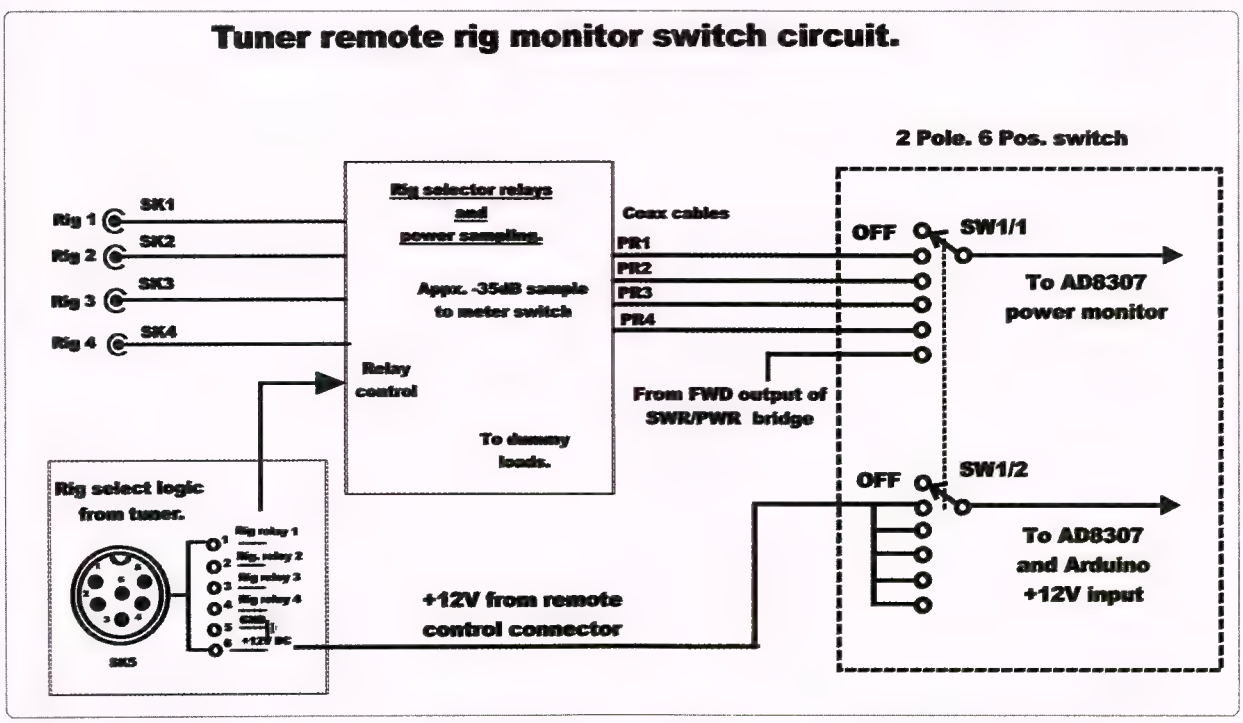


Figure 11. Switch wiring.

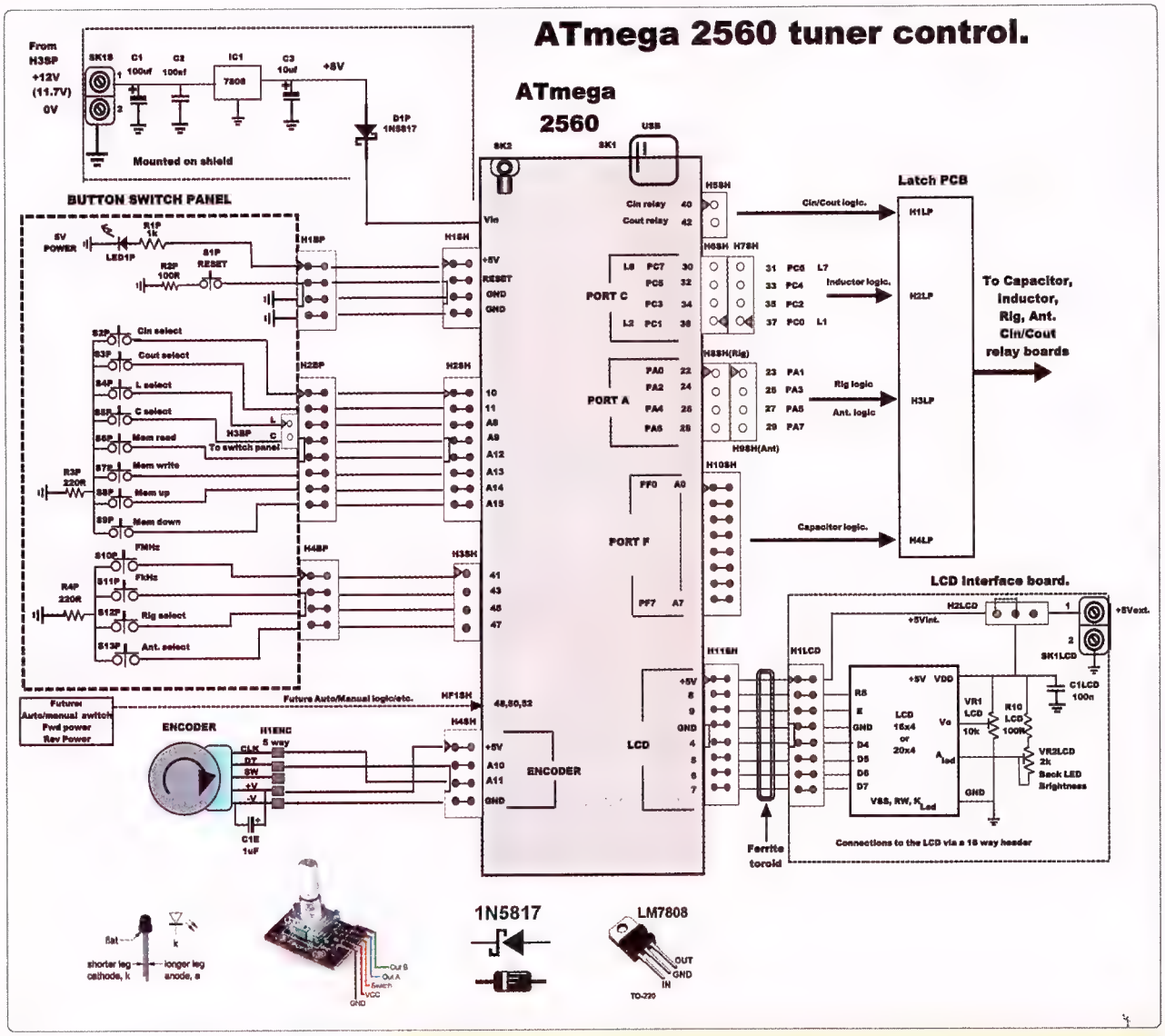


Figure 2 from Part 1.

AN OMISSION

The circuit of the ATU was omitted mistakenly from Lou's first article, so here it is above. [*Amateur Radio*, Vol. 89 No. 3, pages 20-25].

setting, the actual power values displayed on the LCD will jump in small steps, depending on the final mathematical conversion to power in Watts. If you want a more accurate power level reading, there are small, low-cost A/D modules that have a higher number of sampling bits and speed. The Texas Instruments ADS1015 and ADS1115 have 12-bit and 16-bit sampling and are controlled by the I²C bus on the Arduino™ board. These can be used instead. The AD8307 can produce some reasonably accurate power readings over the HF bands with a good dummy load and circuit layout, and over a wide range of input levels.

The display in the power meter shows forward and reverse power in dBm on the first line, plus the forward power in W and the SWR on the second line. 0 dBm is 1 mW. 10 W will read +40, and 100 W will read +50. On my meter, the forward power reads -27 dBm with no signal; that is a power level of 2 µW.

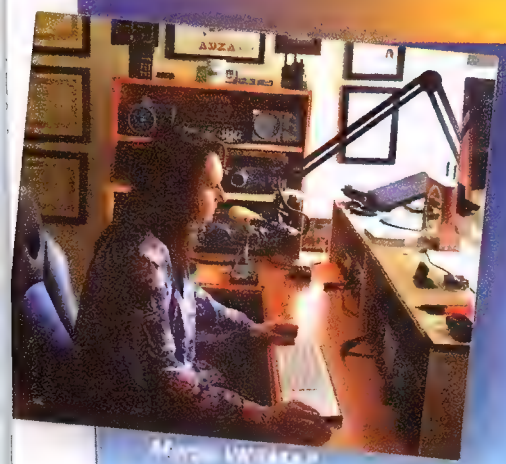
See the column and row contents in Table 5.

The enclosure of this unit is a cast aluminium box. The processor board is mounted so that the USB and DC connector can be accessed through the side. When programming, the USB connector powers the board.

	Columns								e.g. lcd.setCursor(column,row);							
ROWS	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	F	=	5	0	.	0			R	=	2	.	3			
1	W	=	1	0	0	.	8		S	W	R	=	1	.	0	1

Table 5. VK3AQZ remote rig switch 16x2 LCD display contents.

CONTESTING 2022



Catherine VK7GH

Jack VK3WWW, Ralph VK3LL (at back)

Lo the contester!
Mighty are their preparations
Rising early, they head shackwards
Full of great expectations
To re-appear muttering
"CQ contest – QRZ – QRZ – again"
And the truth is not in them!
(after anonymous 'Ode to fishermen').

Martin VK7GN

Aiva (on mic), Lakia VK7LJB

VK4SN's 2022 VK and POPULAR CONTESTS.

Last Up

January			February			March			April			May			June		
1	S	ROSS HULL	1	T		1	T		1	F		1	S		1	W	
2	S	all January	2	W		2	W		2	S	EA	2	M		2	T	
3	M		3	T		3	T		3	S	RTTY	3	T		3	F	
4	T		4	F		4	F		4	M		4	W		4	S	PRIDE
5	W		5	S		5	S	ARRL DX	5	T		5	T		5	S	GRC
6	T		6	S		6	S	SSB	6	W		6	F		6	M	
7	F	YB DX 24Hr	7	M		7	M		7	T		7	S	HA TEST	7	T	
8	S	ARRL	8	T		8	T		8	F		8	S	Don Edwards	8	W	
9	S	RTTY	9	W		9	W		9	S	QRP HRS	9	M	CW	9	T	
10	M	DARC 10M	10	T		10	T		10	S	JIDX CW	10	T		10	F	
11	T		11	F		11	F		11	M		11	W		11	S	VK SHI
12	W		12	S	CQ WPX	12	S	BERU	12	T		12	T		12	S	DL RTT
13	T		13	S	RTTY	13	S	YB RTTY	13	W		13	F		13	M	
14	F		14	M		14	M		14	T		14	S		14	T	
15	S	V/UHF FD	15	T		15	T		15	F		15	S		15	W	
16	S	V/UHF FD	16	W		16	W		16	S	CQMM	16	M		16	T	
17	M		17	T		17	T		17	S		17	T		17	F	
18	T		18	F		18	F		18	M		18	W		18	S	ALI
19	W		19	S	ARRL DX CW	19	S	JMMFD	19	T		19	T		19	S	
20	T		20	S	RU PSK	20	S	RU DX	20	W		20	F		20	M	
21	F		21	M		21	M		21	T		21	S		21	T	
22	S	BARTG	22	T		22	T		22	F		22	S		22	W	
23	S	RTTY 24hr	23	W		23	W		23	S	SP DX	23	M		23	T	
24	M		24	T		24	T		24	S	RTTY	24	T		24	F	
25	T		25	F	CQWW 160	25	F		25	M		25	W		25	S	V
26	W	AX DAY	26	S	SSB	26	S	CQ WPX	26	T		26	T		26	S	
27	T		27	S		27	S	SSB	27	W		27	F		27	M	
28	F		28	M		28	M		28	T		28	S	CQ WPX	28	T	
29	S	CQWW 160				29	T		29	F		29	S	CW	29	W	
30	S	CW				30	W		30	S		30	M		30	T	
31	M					31	T					31	T				

Contesting 2022 Cover: *contesters in their natural habitat.*

This calendar of contests popular in Australia (E&OE) is based on that prepared by Alan Shannon VK4SN, WIA Contest Committee Chairman, and published annually on his website. Used with permission. Visit: www.vk4sn.com/Contests/Calendar

All times are in UTC

You will notice that this pair of pages is the centre sheet of the magazine, which you can easily lift out and post it to the noticeboard in your shack, on the door of your fridge, or elsewhere at-hand.

22			All mode		SSB		CW		DIGITAL
July		**August**			**September**		**October**		**November**		**December**	
F		1 M			1 T		1 S	OCEANIA	1 T		1 T	
S	NZART	2 T			2 F		2 S	SSB	2 W		2 F	
S	MEMORIAL	3 W			3 S	ALL ASIA	3 M		3 T		3 S	FT
M		4 T			4 S	SSB	4 T		4 F		4 S	ROUNDUP
T		5 F			5 M		5 W		5 S		5 M	
W		6 S			6 T		6 T		6 S		6 T	
T		7 S			7 W		7 F		7 M		7 W	
F		8 M			8 T		8 S	OCEANIA	8 T		8 T	
S	IARU	9 T			9 F		9 S	CW	9 W		9 F	
S	HF CHAMP	10 W			10 S	WAE	10 M		10 T		10 S	ARRL 10
M		11 T			11 S	SSB	11 T		11 F		11 S	
T		12 F			12 M		12 W		12 S	JIDX SSB	12 M	
W		13 S	RD CONTEST		13 T		13 T		13 S	WAE RTTY	13 T	
T		14 S	WAE CW		14 W		14 F		14 M		14 W	
F		15 M			15 T		15 S	QRP HRS	15 T		15 T	
S	VK T-TAS	16 T			16 F		16 S	JARTS	16 W		16 F	
S	JAKARTA DX	17 W			17 S		17 M	RTTY	17 T		17 S	OK RTTY
M		18 T			18 S		18 T		18 F		18 S	
T		19 F			19 M		19 W		19 S		19 M	
W		20 S			20 T		20 T		20 S		20 T	
T		21 S			21 W		21 F		21 M		21 W	
F		22 M			22 T		22 S		22 T		22 T	
S		23 T			23 F		23 S		23 W		23 F	
S		24 W			24 S	CQWW	24 M		24 T		24 S	
M		25 T			25 S	RTTY	25 T		25 F	V/UHF FD	25 S	
T		26 F	WW DIGI DX		26 M		26 W		26 S	CQWW	26 M	
W		27 S	ALARA		27 T		27 T		27 S	CW	27 T	
T		28 S	SCC RTTY		28 W		28 F		28 M		28 W	
F		29 M			29 T		29 S	CQWW	29 T		29 T	
S	RSGB	30 T			30 F		30 S	SSB	30 W		30 F	
S	IOTA	31 W					31 M				31	

Anzac Day contest builds on Australia Day event

In announcing the trial of a new contest for Wednesday 26th January this year, the organisers foreshadowed a repeat for Anzac Day, Monday 25th April.

The rules for the Anzac Day Contest are derived from the Oceania DX contest , said the organiser, Trent VK4TS.

The purpose is to encourage Amateur Radio Activity with stations in Australia and New Zealand.

It is also designed to encourage friendly participation and help improve the operating skills of participants. Amateurs in VK and ZL are to try contacting amateurs world-wide.

There are four categories, covering single and multi-operator participants, and four sub-categories, for Phone, CW and Digital, 6-hour and 24-hours.

The start time will be 1200 UTC 24th April, concluding at 1159 UTC 25th April.

Contacts may be made on all allocated amateur bands from MF (160 metres) through HF, except the WARC bands of 30, 17 and 12 metres, which are excluded by IARU agreement from all contest operations.

Winners will be announced within 30 days after the event.

Contesting News

Foxhunting Championships may go ahead

Amateur radio direction finding (ARDF), hidden transmitter hunts, or foxhunting – call it what you will, is a popular sport for those who love spending time outdoors solving unusual problems.

The South East Radio Group (SERG) Annual Convention and National Foxhunting Championships, usually held over the Queen's Birthday long weekend in June, has suffered under South Australia's Covid restrictions. The popularity of the annual event is evident from the accompanying photo of the 30 hunters at the 2019 SERG Championships.

Unfortunately, the 2021 event was first postponed from June to September, but subsequently cancelled as the Covid situation worsened in the state.

Despite the setback, the SERG committee has foreshadowed that, with luck, it'll be a goer this year, again on the Queen's Birthday weekend, which is set down for 11-12 June. Keep an eye on the SERG website, at: *https://serg.org.au*

Passing of contesting personalities

Two major contesting personalities became silent keys in early January, putting a sad marker on the start of the 2022 Australian contest year.

Mike Subocz VK3AVV, developer of the popular and widely-used VKCL logging program, passed away on the afternoon of Wednesday 5 January after a long battle with cancer.

Mike VK3AVV.

As it was put by Mike's friend, Peter Forbes VK3QI, undoubtedly the wider amateur fraternity will miss Mike's particular skills, especially those contesters who have benefitted from his logging programs over the past 20 years.

Mike also held the call VK3JV. He was the proud recipient of a WIA Centenary Award certificate in 2010 for contacts with the VK100WIA commemorative station.

He was an enthusiastic supporter of the VHF-UHF Field Days, in particular joining the champion multi-operator team of VK3ER from the Eastern and Mountain District Amateur Radio Club (EMDRC) of which he was a life member.

In 2014, Mike stepped forward to support the VHF-UHF Field Days by developing a log-checking program. He continued through the following years by providing individual reports to participants who submitted logs and he provided results reports following each event, published on the Field Days' website.

Charlie Strong VK4YZ, co-manager of the Harry Angel Memorial 80m Sprint contest, passed away peacefully in the early hours of Sunday 2 January after a brief but rapid decline in his battle with cancer.

A lifetime member of the Redcliffe and District Radio Club, of which he was Vice President until recently, current President Alan Wills VK4NA praised Charlie as "an all-round great bloke; he will be sadly missed, but has left us all with an enduring legacy of his time amongst us."

Contest to celebrate Pride Month in 2022

The first weekend in June marks the inaugural CQ Pride contest, which is to celebrate the annual Pride Month, support inclusion in amateur radio, and to have a fun time.

Arranged and promoted by the Pride Radio Group, CQ Pride will operate the first weekend of Pride Month every year, and is intended to be a relaxed contest accessible to operators of all skill levels, qualifications, and equipment.

Pride Radio Group, a virtual radio club, was formed in September 2020 to focus on promoting and supporting diversity in amateur radio.

PRIDE RADIO GROUP

CQ Pride will run from 0000 UTC on 4 June 2022, through to 0000 UTC on 5 June. Participants score one (1) point per QSO plus one point if you're licensed less than two years, plus one point for operating QRP (20 watts or less), plus one point for diversity-focused amateur radio groups.

Except for the WARC bands, participants can use all amateur bands, all modes, plus hotspots; spotting is allowed. Signal exchange must include the usual signal report plus the number of years as a licensed amateur, plus the diversity (if any); eg: 593PRG (59 RST, 3 years licensed, Pride Radio Group).

For further details, see: *https://prideradio.group/contest/*

John Moyle Memorial National Field Day 2022 rules

Denis Johnstone VK4AE, VK3ZUX

Note: a new Email address: *jmfd2022@wia.org.au* will only be set up close to the event for log entries; you can check out latest info at *http://www.wia.org.au/contests/*. However, the older address *jmfd2021@wia.org.au* still seems to work.

Contest Period

19-20 March, 2022

0100 UTC **Saturday 19 March** 2022 through
0059 UTC **Sunday 20 March** 2022

I wish all entrants good luck, and look forward to hearing some of you on-air during the contest! For Definitions and additional detail, visit: *www.wia.org.au/members/contests/johnmoyle/*

Overview

1. The aim is to encourage and provide familiarisation with portable operation, and provide training for emergency situations. The rules are therefore designed to encourage field and portable operation.
2. The contest takes place on the 3rd full weekend in March each year, and runs from 0100 UTC Saturday to 0059 UTC Sunday, 19 – 20 March, 2022.
3. The contest is open to all VK, ZL and P2 stations. Other stations are welcome to participate, but can only claim points for contacts with VK, ZL and P2 stations.

Single operator portable entries shall consist of ONE choice from each of the following (e.g., 6 hours, portable, phone, VHF/UHF):
   a. 24 or 6 hours;
   b. Phone, CW, Digital or All modes;
   c. HF, VHF/UHF or All Bands.

5. Multi-operator portable entries shall consist of ONE choice from each of the following (e.g., 24 hours, portable, phone, VHF/UHF):
   a. 24 or 6 hours;
   b. Phone, CW, Digital or All modes;
   c. HF, VHF/UHF or All Bands.
6. Home and SWL entries shall consist of ONE choice from each of the following (e.g., 24 hours, portable, phone, VHF/UHF):
   a. 24 or 6 hours;
   b. All modes;
   c. HF, VHF/UHF or All Bands.

   Multi operator stations are NOT permitted in the Home Category. If a Home Station works the same station regularly during the contest on any band or any mode, they should submit their log to verify those contacts. (See sect. 18 below.)

Scoring

7. Portable HF stations shall score 2 points per QSO. CW only contacts to score 4 points per QSO for contacts with either home or portable stations.
8. On VHF/UHF portable stations for Phone and Digital each contact scores 2 points per contact, and CW contacts score 4 points. In addition, the VHF/UHF Portable stations shall add a distance score of the following on **50 MHz**:
   a. 0-49 km, 2 points per QSO;
   b. 50-99 km, 5 points per QSO;
   c. 100-149 km 10 points per QSO;
   d. 150-299 km 20 points per QSO;
   e. 300-499 km 30 points per QSO;
   f. 500 km and greater, 2 points per QSO.
9. Portable stations shall add an additional distance score on **144 MHz and higher bands**:
   a. 0 to 49 km, 2 points per QSO;
   b. 50 to 99 km, 5 points per QSO;
   c. 100 to 149 km, 10 points per QSO;
   d. 150 to 299 km, 20 points per QSO.
   e. 300 km and greater, 30 points per QSO.
10. For each VHF-UHF QSO where more than 2 points are claimed, both the latitude and longitude of the station contacted or other satisfactory proof of distance, such as the 6-character Maidenhead Locator, must be supplied.
11. Home stations shall score:
    a. Two points per QSO with each portable station.

b. One point per QSO with other home stations.
c. For VHF/UHF QSO Home stations shall add as a distance score on **50 MHz**:
   i. 1 point per QSO;
   ii. 50-99 km, 2 points per QSO;
   iii. 100-149 km 5 points per QSO;
   iv. 150-299 km 10 points per QSO;
   v. 300-499 km 15 points per QSO;
   vi. 500 km and greater, 2 points per QSO.
d. Home stations shall add as a distance score on **144 MHz and higher**:
   i. 0 to 49 km, 1 point per QSO;
   ii. 50 to 99 km, 2 points per QSO;
   iii. 100 to 149 km, 5 points per QSO;
   iv. 150 to 299 km, 10 points per QSO.
   v. 300 km and greater, 15 points per QSO.

Log submission

12. For each contact: UTC time, frequency, station worked, RST/ serial numbers sent/received and claimed score. (VHF and above location of other station and distance showing the Lat/ Long or Maidenhead Locator to 6 figures for the station worked.)
13. All logs must be accompanied by a summary sheet showing: call sign, name, mailing address, section entered, number of contacts, claimed score, location of the station during the contest, and equipment used, and a signed declaration stating *"I hereby declare that this station was operated in accordance with the rules and spirit of the contest and that the contest manager's decision will be accepted as final"*. For multi-operator stations, the FULL names and all call signs (legible) of all operators must be listed.
14. The Email address for this year's JMMFD contest *jmfd2022@wia.org.au* should be setup a few days before the contest, and I would suggest to those who will be sending in your logs electronically, to send in a test email with the words "TEST JMMFD 2022", in subject the line and also set the "REQUEST READ RECEIPT" flag (if it is available on your e-mail system.). Your call sign can then be added into the database for this year's contest. **When actually submitting your log for the contest, if you do not receive an e-mail acknowledging receipt of your log, then the log has not been received.**
15. Paper logs may be posted to "John Moyle Contest Manager, 27 Laguna Ave, Kirwan 4817 QLD". Alternatively, logs may be e-mailed *jmfd2022@wia.org.au*, or to the older address of *jmfd2021@wia.org.au*, or vk4ae@wia.org.au, or snail mailed via the WIA Contest Manager, JMMFD, P.O. Box 2042 Bayswater, VIC 3153. Club stations must forward in the first instance an electronic version of their log. Club Stations who submit only a paper log will have that log returned as unreadable, due to the very large amount of work involved in entering and checking large paper logs.
16. The following formats are acceptable: Microsoft Excel or Word, ASCII text or the print log output file from electronic log programs such as VK Contest Log (VKCL). Logs sent by disc or e-mail must include a summary sheet and declaration, but the operator's full name (legible) is acceptable in lieu of a signature. A PDF copy of a handwritten log is also not acceptable and will also be rejected as it is an image and hence computer unreadable.
17. Because of the publishing lead time of AR Magazine, Logs must be postmarked no later than 8 April 2022, and **as the post is now so slow and unreliable, logs despatched on the last day might not arrive in time.** Electronic versions of the log will be received until midnight 12 April 2022. Any logs received after this date will be returned as ineligible.
18. If any station works the same station multiple times on any band or on any mode, both stations should each enter a log to verify those contacts. This rule was introduced to overcome a problem experienced in previous contests where a portable station worked a significant number of home stations, but those home stations did not enter a log, so there were a very large number of unverifiable contacts.

Certificates and Trophy

19. At the discretion of the Contest Manager, certificates will be awarded to the winners of each portable section. Additional certificates may be awarded where operation merits it. Note that entrants in a 24-hour section are ineligible for awards in a 6-hour section.
20. The Australian WIA Affiliated club station with the highest overall score will be awarded the President's Shield, a perpetual trophy held at the Executive Office, and will receive an individually inscribed wall plaque as permanent recognition.

About contesting, by a contester

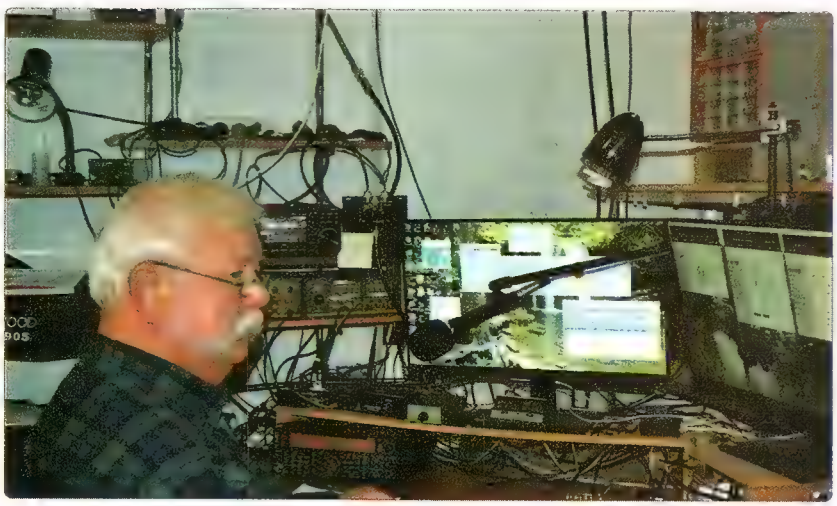
How to enjoy operating HF radio contests and log lots of contacts without needing a superstation or the perfect setup

Martin Luther, VK7GN

So, you have decided to have a go at a radio contest. This article may help you enjoy the satisfaction of putting some contacts in your log.

You have looked at the contest website and downloaded a suitable logging program from elsewhere. From here, you think, it should be easy; just get on, call CQ and wait for the pile of stations calling you!

What some old hands don't tell you is, '. . it isn't that simple'. Well, not for most people without access to big antennas and high power. Even those with a superstation find it hard to beat a well-experienced and skilled operator who otherwise lacks the equipment advantages. For example, there is a W2 that has operated for years and years in QRP categories with wire antennas in trees. He regularly gets scores that would place him quite high in the high-power categories.



The home setup for operating my remote station. The right-hand screen controls antenna switching, rotator and linear. The left screen is the logging program. Just visible is a TS590 that links to another slave TS590 at a remote site.

The 'contest style'

This happens because operating in the sport of radio contesting is like any other sport. You must earn your skill through training and practice. We can all talk; however, not many speak in a *contest style*. That style recognises you are trying to work operators who have English as a second language, or even more. So – there are three things to remember – steady, clear, and simple!

Radio sport is not like any other; we all play on the same playing field, encompassing the elite station and operator and the new contester with a basic station.

So, what can you do to learn some of the skills? I have been operating with some modest success in radio sport for well over 50 years. I have spent a lot of time thinking and developing the best ways to become a better operator.

First, be realistic, you will not win a big competition without the right station, in the right part of the world. The scoring regime of each contest chooses the correct location. For example, if you receive extra points for working another continent, then ideally, you need to be close to one or two continents. Winning locations may be a Caribbean Island or in South America with good propagation to North America (NA) and Europe (EU), or an island off Africa, with good propagation to NA and EU. You will also require the operating skills to run stations at over *four contacts per minute*!

You need to set your sights on something achievable. I have always set my sights on, firstly, having fun. I have won a few trophies and book loads of certificates, but they come as an afterthought. At the end of the contest, I have won if I enjoyed the challenges and personal rewards of the contest.

Goals and scores

The first piece of advice I give anyone is to set some goals other than the contest trophies. Compete with a buddy for best score. Try to beat your score from the same contest in a previous year. Try to set your best rate ever in an hour. Analyse your previous scores and use a contest to improve some aspect of your operating.

I felt that I was taking too long in searching and pouncing (S&P) for contacts at one stage. My rate in that mode was too slow. Because of my location, here at the end of

the Earth in Tasmania, I do not get openings such that I can CQ and run for a whole contest, hence S&P is important. So I allocated some contests to just operating in S&P mode. I gradually improved by learning tricks and how to use the band tables and so on, which are in the contest software.

Logging software: traps & tips

Skilled contesters have produced contesting software with input from expert operators. There are facilities and useful tricks scattered throughout. Learn how to use them to their fullest extent, but avoid being trapped by these facilities. They are tools that need skill in their use.

I have an aversion to a tool called "super check partial." Some find it helpful; I have often found it is misleading. It gives you possible calls from a list of previous contest entrants. As you type in VK7, it will provide a list of VK7s from their previous entry in the contest. However, it is the operator's responsibility to get the call correct. Don't guess, even with help from the computer.

The most important tip I ever received is that your score is directly related to BIC (Bum In Chair); the time you spend operating, calling CQ or searching. Many multi-million-point scores are separated from each other by only a scant few contacts. You must keep going when the going gets tough, and when it is difficult to find new QSOs.

Propagation: get a feeling

We have all sorts of magic computer systems to tell us when propagation is available to what areas. Remember, they are good but not perfect. During contests, bands that seem dead suddenly come to life. You need to have a "feel" and understanding for a band. That can only be gained by hours of listening both inside and outside contests. That way, during a contest, you can quickly evaluate what you are hearing and which way to point the beam – if you have one.

You will also know if the band is open or whether the stations you are hearing are only the ones with big power and huge antennas. This is important because it affects the way you need to operate. If you can only hear big stations, then it will be little use calling CQ as you will not determine if the frequency is clear at the other end. You could well be completely covered up by other stations, especially when targeting Europe.

Even with better conditions, you may well not be hearing stations working locally in Europe. Think things through; a lot of people operate on exact frequencies, like 14,250, 14,255 and so on. So, call on an intermediate frequency 14,252, for example. No response, and you may well be covered up. Try moving a few Hz up, call again, then the same again. If you get to 14,255 then it is likely that QRM is just too terrible in Europe. Next, try at the band edges, above 14,330 and below 14,130. If that doesn't do it, try more S&P or change bands.

Rigs and recipes

I have not mentioned much about equipment. Most transceivers manufactured in recent decades are good enough. Some of the high capability ones are available second hand but are not necessary. An excellent, clear, clean signal is the most critical requirement. Don't overdrive or over compress. It will not help and mostly makes your results worse.

The best antenna you can erect is desirable. Even a couple of extra dB of gain or a lobe in the best direction can make a difference.

I am not trying to provide a recipe for use in every contest, just some ideas to make you think about operating logically. For a new operator, getting involved with a multi-operator station is an excellent way to learn.

Radio contesting is a great way to enjoy amateur radio and at the same time learn a lot of operating skills, including a better understanding of propagation.

Use the web to look up lots of help available. There is even a contest university where you can look in-depth at lots of interesting operating skills.

Resources

Go to: *www.contestuniversity.com/files/* and find the link: K1DG "Optimizing for Amateur radio contesting" in the 2020 Contest University files.

Buy or borrow a copy of *Amateur Radio contesting for beginners*, by Doug Grant, K1DG, published by the ARRL.

Ten tips for tyros

Compiled by Roger Harrison VK2ZRH, VJ2N
[aided by Trent Sampson VK4TS, VK4T]

Contests are for fun. Get a grin on your gob. It should happen during the contest as well as afterwards, when you submit your log. In worldwide HF-band contests it's sometimes possible to work enough stations to get DXCC. Two bites of the cherry! Here are 10 tips for tyro contest contenders.

1. Be prepared

Scouts and Guides know what it means.* Take a leaf from their book. In keeping with that famous cookbook author, Mrs Beeton, who said said: "First, slaughter your Ox", when entering a contest – first, check the website. Contest sponsors and managers publish a host of essential and incidental details about their events. Start early, well before the contest date/s. Follow all the links. Do all the downloads, especially the Rules.

* See: *https://tinyurl.com/2p8hs3mp*

2. RTDR

Read the damn rules! More than just once. Sort out the ambiguous bits. Understand what bands you can use, ponder what category you want to enter, and learn the station-station 'exchange' expected. Simply put – that's the information you will give to the other station and what they will give to you. Note that, by tradition, everyone has a 59 or 599 signal in contests. Even if you have to say 'QRZ' or 'again!' five times before you get the other station's callsign correct. The signal exchange is the precursor to the serious info required by the contest organisers.

3. Tighten your nuts

Antenna maintenance is best done before the contest. Being a tyro, a newbie, or a neophyte, you're unlikely to be QRO. While the strict meaning of that Q-code is "increase power . . shall I increase power?", the colloquial meaning is more like 'running the legal limit'. Hence, antennas are significantly important to your station's technical performance. If you've spent as much as you can afford on feedlines, connectors, masts, towers, and antennas, it is important that everything is in tip-top mechanical, electrical and RF condition.

4. Goals are good. Maybe

If you're motivated by goals, make them achievable. Face it. If you're not a crackerjack contester sporting a 'big gun' remote station (yet!) you're hardly likely to win. **No, wait!** That sometimes happens. My first contest as a newly-minted VK3ZRY – the 1965 John Moyle Memorial National Field Day, an 'all bands' HF-VHF event – I entered with no expectations, running QRP on six and two metres only; I won Section A, VK3 – Portable, Phone (AR, Sept 1965, p.13: *https://tinyurl.com/29zba4tp*). Alright. Won't happen too often. Best that you try to improve on a previous year's entry. Consider attempting DXCC in a two-day HF contest. Try outranking your on-air mate/s. Power isn't the main game, nor the outstanding antenna farm. Actually, operating skill counts a lot. Maybe the most.

5. Loggin' no ligna

Ligna means 'the woods'. Handwritten logging on paper is an unkind use of natural resources. No matter if you're a chookshed typist (hunt-and-peck), get a logging program for you laptop or PC. Their developers know their onions from the woods. Don't be shy, ask other contesters what they use. There are some well-recommended free logging programs around that you can download. Some loggers include the facility to interface with many 'shack-in-a-box' transceivers. When you get your logger, get some practice by using it to log your ordinary on-air activities. Just like riding your bike around the local park before taking it out on the road.

6. Do dat button-push & twist

Get **real** familiar with your rig. It's the tool you'll use the most! All the Tx controls and menu settings can be pretty much set-and-forget, but all the Rx switches, buttons and knobs can be the secret soldiers in your Trojan horse. The RF GAIN knob is your friend. When you hear a weak station being clobbered by a strong station a few kHz away (especially if they're already in the log), turn down the RF Gain and your Rx will cope much better. So will you. Hearing a loud-LOUD station? Turn OFF the Rx preamp. Turn ON some attenuation. Your Rx will thank you. If they're loud to you, chances are you'll be loud-ish to them. Those two steps will have all the money that the LOUD station spent on antennas and linears working **for you**.

7. Stay seated

The more time you spend in the chair, the more time you'll spend on the air and the more contacts you'll have. Focus. Here's the equation: (Rear/Chair) x t = Q ^ n. Dispense with all distractions; eg. texting, Facebook, radio, TV, non-essential phone. Arrange for coffee/tea/springwater/bikkie delivery to the shack every hour; limit break to 6 mins. Remove headphones. Look out window or door into the distance. Use the breaks to stretch-n-bend. Organise meal breaks to take 15 mins max. Exercise, then eat. Rinse and repeat throughout the contest. If you must sleep, it's best to do it in cycles of 90 minutes to match the body's natural rhythm (you're trying to win right?). *www.contesting.com/articles/37*

8. Osculate the oracles

Propagation predictions push up performance. For HF, Space Weather Services is your friend, www.sws.bom.gov.au. Likewise, VOACAP – www.voacap.com. The Hepburn tropo index helps on the higher bands. www.dxinfocentre.com/tropo_aus.html. In the month leading up to your chosen contest, particularly the week beforehand, the propagation forecasting websites will be able to give you a 'feel' for the propagation during the contest, particularly the diurnal variations. But – it is wise to remember that band openings can happen serendipitously. Where the rules allow, monitor 'cluster' or 'spotter' websites for real time reporting.

9. Pile-ups are putrid

Generally, they're a waste of time. Big guns often think they're fun; perhaps they are. If you're not in their league, move away. Early in a contest, a pile-up is tempting. Should you hear a rare call among the pile-up, try calling from the periphery; you could get lucky. Otherwise, wince and walk away. Later in the contest that rare one you heard may still be around and looking for QSOs well after the big guns have moved off to greener pastures. This time, they'll be easy to put in the log. Rule of three: three calls to a run station. No answer? Move away. CQ for 3 mins. No answer? Move away. Doesn't work? Change bands.

10. Maximise ya mults!

Check the scoring system beforehand. See if **'multipliers'** are included. It's a way to boost your score: you get a set number of points for each contact; then, depending on the contest, you get an additional mult for each new country, state, county, etc worked. Calculate your total score by multiplying the points/contact by the number of mults. RTDR! Check to see if your logging program calculates it for you. The good ones do.

OK. I lied. There are more!

11. Ears B4 gob

Listen. Listen carefully. Ensure that you have the other station's call and the required exchange (eg. serial number, or whatever). Even pre-post it in your log. Listen to their 'pattern'. Do they say 'QRZ?' after each contact, or call CQ contest? Ensure you're calling them when they're listening. Work them (ensuring they've got **your** call correct!), hit enter, and they're in your log. Move on to the next one.

12. Not Very Kind Ny-Nah Sugar Daddy

Use standard phonetics. The above may be cute, perhaps. Imaginative, maybe. 50 years ago, old timers bagged that style, even then. In contests, cutesy phonetics is a source of confusion for other operators and makes for logging errors. It's also considered poor practice. When I call 'CQ contest', *VIC tah KEY loh TOO ZOO loo ROW me oh hoh TEL* is what other operators expect to hear. When conditions are noisy (QRN) and/or there's interference from adjacent channels (QRM) in crowded bands, unfamiliar phonetics don't cut the mustard. Usefully, the ACMA has published a phonetic alphabet for amateurs, which includes recommended pronunciation. This is based on the *International Radiotelephony Spelling Alphabet*, also known as the *NATO Phonetic Alphabet*. Use it. It works.

www.acma.gov.au/amateur-radio-operating-procedures#phonetic-alphabet

https://en.wikipedia.org/wiki/NATO_phonetic_alphabet

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vards
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nt to test yourself? And your station?
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WIA history

Our origins go back to 1910, when the first Institute was formed to represent wireless experimenters to the government. Major reform of the Radiocommunications Act over the early 2000s, and to amateur radio licensing worldwide, saw a single national organisation formed in 2004 to meet the emerging challenges

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Beyond the horizon – strategies for field day contesting on the bands from six metres on up

Roger Harrison, VK2ZRH - Manager, WIA VHF-UHF Field Days

The **VHF-UHF Field Day** events are held in the same months each year: January for the Summer Field Day, June for Winter, and November for Spring. The Winter FD is 'tied' to the June solstice (20/21 June). The Spring and Summer events have been held on various dates that have differed widely over the years, sometimes chosen by the "beauty parade" method (the most popular date returned from a survey) or to avoid clashing with other events, rather than being determined by any calculable method.

To obviate endless argy-bargy over dates for the three events, I developed an algorithm to calculate the dates in any year, based on the dates of the winter and summer solstices (June and December, respectively). You can download a PDF of An algorithm to determine future VHF-UHF Field Day dates, from the VHF-UHF Field Days website [1].

"The whole point of contests is to do better next time"

The WIA sponsors a series of three VHF-UHF-microwave field days three times over each year – Summer, Winter and Spring. The purpose behind them is to provide platforms to encourage activity on the bands from six metres (6-m) on up, through to 248 GHz. Currently, using modulated light or other sources for producing transmissions above 300 GHz, are not permitted for making contacts on the VHF-UHF Field Days.

Scoring of contacts is based on the basic idea of 'reward for effort' in building, assembling, deploying and operating a station on the bands above 30 MHz. Points are awarded for the distance to the stations you contact, with a multiplier for each band. The principles behind the use of distance-based scoring system are to:

(a) educate newcomers to the VHF-UHF-SHF (V-U-SHF) bands in the capabilities that the bands afford beyond the mythical "line-of-sight" propagation limit,

Two of the multi-operator team in action with VL3L in the 2021 Spring VHF-UHF Field Day. In the foreground in Jack VK3WWW, behind him is team leader Ralph VK3LL.

(b) encourage self-education in V-U-SHF operation by contest participation, and

(c) to continue the tradition of so many V-U-SHF pioneers who sought to establish 'what could

The VK2SRC/p club station deployed at Vista Point in northern NSW for the 2021 Spring VHF-UHF Field Day, operating on all bands from 50 MHz through 3.4 GHz. Note the use of both horizontal and vertically polarised arrays. Horizontal polarisation is the predominant standard for weak-signal working on the lower end of the bands, while vertical polarisation is used on the upper end of the bands for FM/CFM/DMR modes.

be done' on the bands above 30 MHz (eg. Ross Hull 3JU / VK3JU).

It should be no surprise, then, that repeater, satellite, EME or cross-band contacts are not permitted.

Each band on which you operate has a scoring multiplier, so that the higher the frequency, the greater the multiplier. But there's a twist – six metres has a higher multiplier than two metres (but smaller than 70-cm). This is to account for the fact that, when going portable, antenna gain on 6-m is more difficult and less practical to achieve than for 2-m. It's all explained in this article: *The basis of distance-based scoring for the VHF-UHF Field Days*, by yours truly, published in Amateur Radio, June 2014, pp 11-13. A PDF is posted on the VHF-UHF Field Days web page [1].

Currently, there are four (4) sections – single-operator portable, multi-operator portable, rover, and home stations. Each section has three (3) sub-sections:

(a **Single-band only:** any single band permitted on the operator's licence;

(b) **Four-bands:** 6-m/2-m/70-cm/23-cm – any two, up to the four – only; and

(c) **All-bands:** all bands, from 50 MHz-up, as permitted on the operator's licence.

A station is portable only if all of its equipment is transported to a place that is not the normal location of any amateur station. Portable stations may change location during the Field Day, provided that the station is dismantled and reassembled at each move.

The sub-section of Single-band only is designed to encourage newly-licensed operators, those new to the bands above 30 MHz, those returning to the hobby after a period of absence, or any operator who takes it in mind to join in casually. Additionally, it's for anyone with a passion for a particular band who takes it in mind to have a red-hot go!

If you're in this group, but have your act rather more together, consider entering the Four-bands Sub-section. At a minimum, you can operate **on any two** of the bands 6-m/2-m/70-cm/23-cm, or three – or the whole four. There are now quite a number of HF+VHF-UHF rigs available on the new-in-box and pre-owned markets that operate from 12-13.6 VDC battery supplies.

A founding principle of the Field Days is to spend time outdoors and have fun, so the Single-band and Four-bands Subsections meets that

Multi-operator station VL3L (Ralph VK3LL) at Enfield, Victoria, deployed on a site once the location of a VHF Omnidirectional Radio Range (VOR) aircraft navigation system. Note the array of Yagis on masts scattered across the site for bands from 50 MHz through 1296 MHz, and an offset-fed dish in the foreground with a three-band feed for microwave bands.

The VK4IF/p Yagi arrays deployed for their winning onslaught on the 2020 Spring VHF-UHF Field Day. On the left is the 6-m Yagi on its own mast, with 2-m and 70-cm Yagis on the other mast at the right.

philosophy and provides a taste of that for newbies. Look out, you might get hooked!

To obviate boredom and maintain the pace when propagation openings occur, these field days have **a two-hour re-work period**. Stations may be worked again on each band after two hours have elapsed.

If either station moves to a new location in a different Square, repeat contacts may be made immediately.

For those who are 'old hands' at VHF-UHF Field Day shenanigans, why not invite a Foundation licensee or Standard to join you in the field. Or, invite either (or both!) to your home QTH for a few hours of the contest.

Likewise, if you know someone returning to the hobby, get them involved and mentor them through the process of making contest contacts. You never know what might happen.

Home stations may enter as a multi-operator station, but only one callsign can be used, and only one operator at any one time.

Acquaint yourself with the Contest Radar website (*www.contestradar.com*). Enter your planned portable location (6-character locator), or your home QTH, along with other salient station details. The website will display your details on a map – along with the fleet of other stations doing the same. You can see at a glance who's where. Notably, the website is integrated with the VKCL logging software.

How to win?

Back in 2020, the indefatigable Brisbane VHF Group, callsign VK4IF, set out to win "the most difficult section" – Portable, Multi-operator, All-bands, 24 Hours. Their tale of adventure, planning, mishaps and derring-do in tackling the 2020 Spring event was told in Amateur Radio last year, titled: *How to mount a VHF-UHF Field Day multi-operator station and win your category without losing friends, breaking the bank, or going bonkers*," authored by Kevin Johnston VK4UH, Scott Watson VK4CZ, and Colin Cortina VK4MIL [2].

The VK4IF team achieved the top score in the Spring 2020 event for the Section they entered. They all still grin about it.

References and resources

[1] WIA VHF-UHF Field Days website page: *www.wia.org.au/members/contests/vhfuhf/*

[2] 2021. Johnston, K., Watson, S. and Cortina, C. "How to mount a VHF-UHF Field Day multi-operator station and win your category without losing friends, breaking the bank, or going bonkers", *Amateur Radio*, Vol. 89 No.1.

Justin VK7TW deployed his four-band single-operator setup for the 2021 Winter field day, using Yagis for 50 MHz, 144 MHz and 432 MHz, and a dish on 1296 MHz. The site is Peppermint Hill in Hobart, Tasmania.

2021 Remembrance Day Contest report

Alan Shannon, VK4SN

No surprises, VK7 is the 2021 winning state for the Remembrance Day Contest, yet again! Twenty percent of the state's total number of individual licences, or 47 percent of actual participants, submitted logs.

The 2021 runners-up were VK5, with 31 percent of the state's participants submitting logs.

About 990 operators took part in creating greater log content than in previous years, resulting in considerable activity for the full 24 hours.

Individual winners

Single-operator Phone (SOPH): Alan VK2EFM, who set a new record with 1215 points.

Single-operator CW (SOCW): Allan VK2GR, scoring 456.

Single-operator Mixed (SOMX): Lawrie VK5LJ, with a new record of 1176.

Low Power Phone (QRP PH): Heath VK3TWO set a new record, with 612 points.

Low Power CW (QRP CW): Chris VK3QB scored 278 points; and QRP MX Gerard VK2IO, with 293 points.

The **Highest-scoring Rookie** 'badge' was won by Scott VK2SDX, scoring 210 points in the Single Op Phone section. The **Top Foundation Operator** badge will not be included now or in future, unfortunately, because callsign allocations no longer represent licence grade.

Team and Multi Operator results

Multi-multi section gong goes to the Northern Corridor Radio Group, VK6NC, with 1334 points.

The Multi-single section was taken out by VK4KW, with 1150 points.

Top Team was "Cronies+1" (Richard VK7ZBX, Murray VK7ZMS, Hayden VK7HH), with a score of 2932.

Find out how you faired in the results table here, Table 1.

Photo 1. Bob VK2ADF used this WWII CPRC-26 VHF rig. It's crystal controlled, operates over 47 to 55 MHz, and runs 300 mW. Bob used a Buddipole antenna.

Comments

A total of 310 logs were submitted (up, from 256 last year), showing 38,076 QSOs against 31,872 from last year. Five paper logs were received, one of them computer generated.

Most logs were uploaded to the VK log checker site, but some operators experienced errors due to server issues and they forwarded their logs to the manager for processing. Some 82 contestants forgot to upgrade their VKCL logger before the contest and were unable to upload directly to the log checker site.

Everyone should check for the most up to date versions of logging software prior to any contest. Updates include advancements in submission techniques, rule changes, scoring and bug fixes.

Logging errors required 1459 log score adjustments. As mentioned in last year's report, it is apparent that a lot of operators do not use phonetics and most points lost were from incorrect call logging.

The greatest number of mistakes were logging of similar sounding letters like, T and P, N and M, E and C, as well as D and B. Other common mistakes were using the same prefix as your call when logging interstate calls.

Surprisingly, 200 QSOs were never logged at all!

Some logs contained severe time and date problems that lost points to both operators as the contacts did not appear in the log at least 15 minutes either side of the logged QSO time. Many points were lost due to the logging of the incorrect band – prominently, VK7s –jumping from one band to another without due care to logging details correctly.

State	NR of Logs	Logged Contacts	PH	CW	Raw Score	Weighing Factor	Weighted Score	Percentage of Licensees who put log in	Percentage of Participants who put log in
VK 1	8	642	596	46	837	443	1.89	2	44
VK 2	61	6923	6009	699	9357	4169	2.24	1	27
VK 3	69	6619	6225	394	8324	4129	2.02	2	29
VK 4	33	4600	4374	226	5872	2800	2.10	1	26
VK 5	39	6549	6206	343	8242	1404	5.87	3	31
VK 6	38	3898	3879	19	4609	1373	3.36	3	45
VK 7	57	8683	8401	282	12773	625	20.44	9	48
VK 8	0	0	0	0	0	144	0.00	0	0
ZL	5	162	121	41	216	5000	0.04	0	10
TOTAL	310	38076	35811	2050	50230	20092	TOTAL	2	31

Table 1. Logs and contacts submitted, showing VK7's huge weighted score.

Team Name	Callsign1	Score	Callsign2	Score	Callsign3	Score	Total
Cronies+1	VK7ZBX	1027	VK7ZMS	875	VK7HH	1030	2932
Crocodiles	VK4SN	1003	VK4KW	1150	VK4WIS	583	2736
Grassy Hut Hams	VK7DW	514	VK7PD	313	VK7LH	281	1108
Lake Macquarie Lockdown Warriors	VK2ZG	171	VK2MOR	271	VK2PV	543	985
NSW Wombats (CW Only)	VK2GR	456	VK2PN	198	VK2WQ	192	846
NORA	VK6JEF	76	VK6COL	148	VK6MIL	62	286
The Devil Radio Rookies	VK7LEE	29	VK7HXT	129	VK7XHJ	113	271
WH-1	VK6EZ	32	VK6AKR	13	VK6FRDM	56	101

Table 2. Team Results.

SINGLE OP PHONE								SINGLE OP CW	
Callsign	Points	Callsign	Points	Callsign	Points	Callsign	Points	Callsign	Points
VK2EFM	1215	VK7MO	136	VK6GHZ	50	VK6AKR	13	VK2GR	456
VK7HH	1030	VK7HXT	129	VK6MJC	50	VK2KQB	12	VK2KJJ	234
VK5PAS	1028	VK2LDM	127	VK2MET	49	VK3DRH	12	VK2PN	198
VK7ZBX	1027	VK3CHI	127	VK3OM	49	VK4KWS	11	VK2WQ	192
VK7TW	1024	VK4ACN	127	VK4ADC	49	VK4VO	11	VK2ALR	170
VK7ZMS	875	VK6RC	126	VK2XJM	48	VK7OR	11	VK2IG	158
VK7OO	747	VK3FS	120	VK0PD	46	VK1CM	10	VK3MV	146
VK2DG	696	VK6CPU	119	VK5NYD	46	VK5KIF	9	VK2AYD	106
VK2YI	638	VK3BBB	114	VK7NTK	46	VK7ZRF	9	VK2KI	104
VK5CB	636	VK6LV	114	VK3JWT	44	VK2SIM	8	VK2EAH	88
VK1MA	620	VK5AZL	113	VK3UKW	44	VK7STO	8	VK2BHO	82
VK7JGD	599	VK7XHJ	113	VK7DM	44	VK3TTT	7	VK1PWE	56
VK7GH	599	VK2LEE	112	VK1PE	43	VK6HNM	7	ZL2GD	54
VK3LCM	594	VK3SAY	111	VK5AVQ	43	VK7KWB	7	VK5DC	52
VK2PV	543	VK3ASU	110	VK6NUL	43	VK7RI	7	VK7RD	52
VK2MT	529	VK5BC	109	VK6JN	42	VK3VMM	6	VK1DA	34
VK6ZRW	492	VK5AYD	107	VK7IAN	42	VK4ZI	4	VK3DID	34
VK7KAJ	475	VK4KLC	106	VK7KRJ	42	VK2OX	3	VK4TT	18
VK7GS	468	VK2JEH	104	VK5PX	41	VK3KZM	3	VK2KX	6
VK2FO	423	VK3FUR	103	VK7MMT	40	VK3CHR	2	VK2UE	6
VK5RS	407	VK2TS	102	VK3ZSC	39	VK7JFD	2		
VK7BW	377	VK3AMW	102	VK4YEO	39	VK1ERF	1	QRP PHONE	
VK7HW	330	VK2KHA	100	VK2MOH	38	VK3TCP	1	Callsign	Points
VK2YY	308	VK6USB	100	VK2SJ	38	VK5SAM	1	VK3TWO	612
VK7QP	306	VK5OQ	99	VK5ST	36	VK7ZDM	1	VK3MNQ	290

Loggers used versus users – VKCL 268 (82 used out-of-date versions, and over 10 different versions); N1MM 14; Typed-up by the manager 12; RD Logger 10; Logger converters 3; Personally typed-up 2; and SD logger 1.

Conclusion

As per usual, there is a full report and statistics on the WIA Website in the download area. 1st, 2nd and 3rd place getters will receive a printed certificate from the WIA office. State winner and team certificates are in PDF format, which can be downloaded from the website and printed by the operator.

Thank you to those involved in getting a guest speaker for the Remembrance Day Contest opening speech, especially Peter VK1PE, and those who put the speech to air.

SINGLE OP PHONE							
Callsign	Points	Callsign	Points	Callsign	Points	Callsign	Points
VK7ZTA	305	VK6JP	99	VK2JCC	35	VK1JB	0
VK5COL	289	VK3MDH	96	VK7KW	35		
VK7LH	281	VK2KDP	93	VK2AOR	34		
VK7DG	275	VK6GD	87	VK6NT	34		
VK2MOR	271	VK6MM	83	VK6HDY	33		
VK3KTT	270	VK2DEK	82	VK6AAO	32		
VK7RM	269	VK4JSS	81	VK6EZ	32		
VK3JK	259	VK3JNF	78	ZL4SY	32		
VK6DDX	240	VK6FD	78	VK2HTV	30		
VK5AKH	239	VK7ZCR	76	VK7LEE	29		
VK3MB	234	VK6JEF	76	VK4PDG	28		
VK4NM	217	VK3ZLT	74	VK7EV	27		
VK3IE	214	VK3APJ	74	VK5VC	27		
VK2SDX	210	VK1CCJ	73	VK6CG	27		
VK6YD	208	VK4MZ	72	VK5JAK	26		
VK2JNA	201	VK4DX	72	VK3CWS	24		
VK2ZK	199	VK6NCB	72	VK7AN	24		
VK3YV	196	VK3VDX	69	VK3FI	23		
VK7RE	191	VK4CCV	69	VK3GP	23		
VK3HAU	180	VK3SRC	68	VK2UVP	22		
VK3DEN	179	VK3LSN	65	VK7IT	22		
VK5DT	178	VK4PR	64	VK2GRH	21		
VK3EV	174	VK3GK	63	VK6GOM	21		
VK2ZG	171	VK6WU	63	VK7SW	21		
VK4BFQ	170	VK5ALX	62	VK2XD	20		
VK7ZGK	166	VK6MIL	62	VK4ATH	20		
VK3AMO	162	VK2BFC	60	VK4MST	20		
VK2BGL	158	VK3DY	60	VK6FN	20		
VK3LF	157	VK2PPM	60	VK3VLF	19		
VK7IF	154	VK4HDY	59	VK4CEG	19		
VK5CP	154	VK6ZMS	58	VK7FPCL	19		
VK2VE	153	VK7KK	58	VK2EY	18		
VK5DMC	152	VK2DWP	56	VK3SN	18		
VK5LA	151	VK5UW	56	ZL4KYH	18		
VK3TIN	149	VK3BOY	54	VK5JQ	16		
VK6COL	148	VK4FLR	54	VK7ZPD	16		
VK3KK	145	VK3BQ	53	VK3BCZ	15		
VK5JW	142	VK3ABV	51	VK5BRO	15		
VK5MK	142	VK2MDP	51	VK7KC	15		
VK7LG	141	VK6POP	51	VK4PQ	14		
VK3ADW	139	VK6FRLR	50	VK2KAW	13		

SINGLE OP MIXED	
Callsign	Points
VK5LJ	1176
VK4SN	1003
VK7DW	514
VK3ELH	513
VK5SFA	489
VK3MH	460
VK7GN	451
VK7BO	429
VK7PD	313
VK4FOMP	276
VK6VZ	244
VK5PL	221
VK5XY	211
VK5IR	202
VK4AMG	193
VK6WB	135
VK3JL	101
VK5FD	97
ZL3RIK	92
VK3CTM	55
VK3VT	42
VK4XU	31
VK6GC	31
VK5AV	27
VK3ZAP	22
ZL4RA	20
VK2AEJ	18
VK2JDR	17
VK2JA	10
VK3VDP	7

QRP MIXED	
Callsign	Points
VK2IO	293
VK3YE	128
VK7KPC	40
VK2VV	34
VK5KK	2

QRP PHONE	
Callsign	Points
VK3OAK	280
VK7VH	159
VK3DLL	129
VK2NMZ	71
VK7WN	66
VK7SH	58
VK6FRDM	56
VK2YW	44
VK7LAG	27
VK3JW	25
VK4FABN	21
VK3DNS	20
VK2MK	17
VK4WOO	12
VK3HAG	7
VK4GTR	4
VK2JNC	2

QRP CW	
Callsign	Points
VK3QB	278
VK3VB	190
VK4XQM	16
VK3HN	12

MULTI-SINGLE	
Callsign	Points
VK4KW	1150
VK4WIS	583
VK6HC	79

MULTI-MULTI	
Callsign	Points
VK6NC	1334
VK4HH	1259
VK5ARG	1014
VK5BWR	352
VK5WOW	75

Table 3. Individual operator results.

Christmas Island dreaming: my budget VK9XX DXpedition

After 40 years of aspiring, dreaming and longing, I finally realised my ambition

Steve Kennedy VK6SJ

Living in Perth, Western Australia, ever since I started in amateur radio in the early 1980s, I have always wanted to do a VK9 DXpedition. From my earliest time in the hobby, from a QTH in the Pilbara region in the north of WA I used to work stations on Christmas Island and Cocos (Keeling) Islands. Having grown up in a town that had a sizeable Christmas and Cocos Islands Malay ex-pat community, I always wanted to visit and operate from these islands.

I visited Cocos (Keeling) Islands in 1988 while I was in the Navy, but the lure of duty-free alcohol, coupled with my 22nd birthday, beckoned more than the hobby on the day! In 2019, I spent five days on Christmas Island on a survey, prior to installing a radio network for the Australian Government. I met a few members of the Christmas Island Amateur Radio Club (CIARC) and made a couple of quick contacts from the club station on 20-m.

In early 2021, I was fortunate enough to be a part of the VK9CE DXpedition to Cocos (Keeling) Islands, which served as a great learning ground. Knowing I was going to be spending two weeks on Christmas Island a few months later, I wanted to see if I could apply a few lessons from Cocos at Christmas Island.

My stay on Christmas Island was for just over two weeks. However, my work program in June as a government contractor was ridiculously busy. As I was working almost every day I couldn't extend my trip to include some all-day operations. My operation was limited to late afternoon, evenings, and early mornings only (around 4-6 hours per day).

The time limitation also required my station to be simple and quick to assemble, as well as quick to change bands. While I am a one-eyed Flex

I mounted my multi-band dipole on a small rise using 7-metre squid poles.

Radio aficionado, I hate QRP, and I enjoy working a pileup as either DX, or a good contest station. For this trip, I needed to adjust my principles and in the end, I took the FT-857D out of my car and a SOTA Beams multi-band dipole cut for 20-30-40 and 80 metres. I also took three 7-metre tall squid poles to support the dipole. I had contemplated taking my ATAS 120 tunable antenna but figured it wouldn't work as well as the multi-band dipole.

Leading up to the DXpedition, I borrowed squid poles from Wayne VK6EH and Brian VK6MIT, the dipole and an auto-ATU from Glynn VK6PAW. I arranged the use of the CIARC club callsign, VK9XX. I had VK9XX temporarily attached to my HamRadioDeluxe licence, organized ClubLog, EQSL and LoTW accounts, and my good friend David Luñez EB7DX again took on the QSL management duties.

Zorro JH1AJT offered to contribute to the DXpedition. However, after further discussion, he kindly donated to the Christmas Island Amateur Radio Club who allowed me to use the callsign.

I advertised the DXpedition in the same forums we used for VK9CE, and this time I had frequencies listed for each band and mode on the VK9XX QRZ page. I used Fox/Hound mode for FT8.

Excitement rises

The apartments I stayed at were at around 160 metres above sea-level and had a Northwesterly 80 degree view of the ocean, which was great for Africa, Asia and Europe, OK for the USA, but hard for South America and Australia. Behind me, the island reached a peak of 300 metres. I managed to get the corner apartment which was built on a small rise, so I had the multi-band dipole up around 8 m from the rest of the ground.

Given that I was operating barefoot (under 100 W is QRP, right?), my focus was on FT8. However, I did try SSB for the first 10 minutes of each hour (when I remembered), and I did manage to make a couple of very rough CW contacts.

My initial goals this time around were:

- Give plenty of time to Japan (because they are such great operators!).
- Focus on North America, which is a challenge from this part of the world and an area we neglected a little on the Cocos DXpedition.
- Focus equally on 20-m – 80-m.

Here we go!

I arrived on Christmas Island on Thursday, 27 May 2021, and managed to complete my work for the day by around 4pm, so headed to the apartment to get set up to make some noise! The multi-band dipole was relatively easy to get set up (took me about half an hour). The radio gear went together easily enough, as I had also used the same FT8 setup on another IOTA activation in early May (Coconut Island and Thursday Island – OC-138).

The one thing I hadn't factored into the equation was the lack of 3G data on the Island's Mobile Phone network. My phone worked for voice calls but no internet access! My 4G Nighthawk modem was useless to me. This meant that, on my first night of operation I couldn't get my time accuracy on FT8 down under about a second. I still made plenty of contacts, but it was very frustrating. As I was running a modest station, and with no internet access, I couldn't spot myself anywhere.

In the end, I would start on the normal FT8 frequency and then migrate to Fox-and-Hound on a separate frequency, after a few contacts and a few cycles of messaging where I was heading.

The next day, I had a subscription for a Wi-Fi service and these problems were all solved. I also repositioned the antenna for better performance and, apart from a small glitch where my own squid pole went from a 7 m to a 6 m squid pole, the system remained that way for the remainder of the trip.

Most days I was on air by around 1700 local time (1030Z) and I stayed on air until around 9 or 10pm each night, then again for a couple of hours from 5 or 6am to around 8am. A notable exception was the first Sunday I was there, which was the only day off work I had for the trip.

I managed a good run on the higher bands right up to 10-m throughout the day. I did try 6-m but, while I did print a couple of YB stations, no one could hear me. Conditions on that Sunday were so great, I really wished I could have stayed on for another week to play.

Notable items

Some notable contacts were LU7HF on SSB as well as FT8. We tried and tried and finally made a very quick contact on SSB after a lot of email dialogue beforehand! Also, Lada OK2PAY, whom I worked often from Cocos and worked on five bands from Christmas Is. And of course, Mas JA7FAS, who is also a member of the CIARC; I think Mas worked me more than any other station (all bands, except 80-m and 12-m).

Eighty metres wasn't particularly good hunting ground. The antenna was way too low for any good performance, and some of the days I had programmed for 80-m, I ended up shifting to one of the other bands instead.

Big shout out to David EB7DX who managed VK9CE, VK9XX and VK6SJ/4 (Torres Strait) QSL cards for me this in 2021 and done a fantastic job managing both direct and bureau cards. I'd recommend him for any future DXpeditions.

All contacts have now been uploaded to eQSL and LoTW. QSL is via EB7DX.

New lessons learned

I did learn a few more lessons on Christmas Island.

The Christmas Island 'shack'.

1. Fox-and-Hound mode. Keep the queue low. Leaving the queue at maximum meant that stations at the end of the queue may have been calling for 30 minutes or more and many will have given up. This then wastes at least a minute while I call someone who has already left, compounding the issue. Keeping the queue low means that most of the contacts go through, equating to more throughput of contacts. Having said that, while I was cooking and eating meals, the queue was at maximum so I could stay on air and be giving out contacts while eating enough to survive the trip!

2. I was amazed at the lack of understanding of many on how F/H mode works. I found that placing an explanation of it in a paragraph or two reduced the number of stations calling me outside the F/H window.

3. Even in Australia, you need to check internet access before you go. I lost a chunk of the second day organizing internet access for the rest of the trip.

I had a ball doing the DXpedition this and will definitely be back for another try, hopefully next time as a full-time operation with more power and a better antenna system. Thanks to all who supported the operation and of course, all those that worked me.

Some statistics

1.	**Contacts by Continent**	
a.	Asia	2277
b.	Africa	20
c.	Europe	1061
d.	Oceania	224
e.	North America	451
f.	South America	30
2.	**Some country statistics**	
a.	Japan	2018
b.	USA	404
c.	Australia	78
d.	Indonesia	129
3.	**By Band**	
a.	80m	99
b.	40m	778
c.	30m	834
d.	20m	1638
e.	17m	281
f.	15m	234
g.	12m	73
h.	10m	134
4.	**And by mode**	
a.	FT8	3863
b.	SSB	206
c.	CW	2
d.	QSL Cards	
e.	Cards requested direct	250
f.	Cards requested via Bureau	218

Unravelling the mysteries of connecting radios to antennas

Part 4 Article 1 Baluns: design and construction

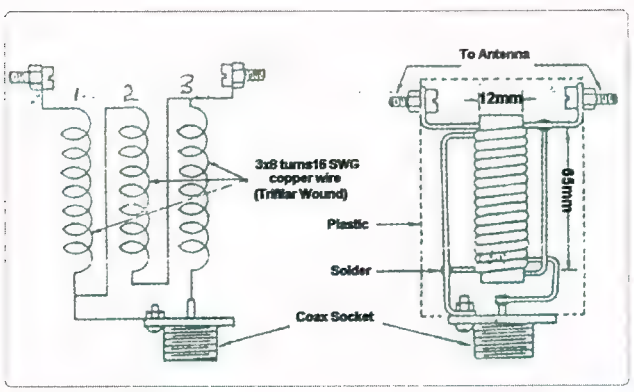
Brian Clarke, VK2GCE
e *brianclarke01@optusnet.com.au*

Corrigendum

There was an error in Part 2 of my series (*Amateur Radio*, Vol 89, Issue 4, page 15, column 2, line 4). The formula from Johnson should have read: $Z_0 \approx 377 \log_n (8s / w + w / 4s) / 2 \pi \sqrt{\varepsilon}$. However, this formula does not deliver the required and predicted low characteristic impedance, Z_0.

A better formula, where $w / s > 1$ is $Z_0 = 377 / \sqrt{\varepsilon} [w / s + 2]$, sourced from **Kraus** and **Marhefka** (2003:891); this formula more closely approaches our normal understanding of the impedance of transmission lines, and is appropriate for achieving rather lower Z_0 than is reasonably affordable with coaxial cable, the purpose of my article.

I am grateful to Lew Whitbourn for going the hard yards to find my error.



W2AU 1:1 balun.

Some balun design considerations

There are four major concerns in constructing baluns and ununs:

- output impedance
- turns ratio and impedance ratio
- construction materials and methods
- power handling capability.

Let's check them out.

Output impedance

In some literature, you will find reference to current baluns / ununs and voltage baluns / ununs. What is really referred to is output impedance. If you use a balun to feed the centre of a balanced half-wave dipole, you would use a low impedance balun and you would call it a current balun. If you use an unun to feed the end of a half wave antenna, it would be a high impedance device and you would call it a voltage unun.

Some typical applications and (approximate) antenna feed impedances are:

- Multi-parasitic Yagi: perhaps as low as 5 to 8 Ω
- Simple three-element Yagi with a straight drive element: about 12 Ω
- End-fed Zeppelin: 1000 to perhaps 5000 Ω
- Quarter-wave vertical over horizontal ground-plane: 36 Ω (for example, car roof-mounted VHF and UHF whips)
- Quarter-wave ground-plane vertical with radials drooped 135°: 50 Ω
- Horizontal dipole 0.18λ above ground: 50 +j50 Ω
- Well-isolated, horizontal or vertical, resonant dipole: 72 Ω

W2AU 4:1 balun from outside.

What do baluns look like?

Here are some commercial baluns by W2AU. From the image of the innards, you can see how easy it would be to roll your own.

W2AU 4:1 balun innards.

- Off-centre-fed dipole: 150 to 1000 Ω depending on feed-point
- Five-eighth-wave vertical: about 200 Ω.

The impedances quoted for the first five examples are at the fundamental resonant frequency - the impedance will be different (usually higher) for other resonant frequencies. A balun / unun works best into constant impedance. And you get the highest power transfer when the output impedance of the balun / unun matches the feed impedance of your antenna (Jacobi theorem). If you intend to use just one balun / unun for multiband **operation,** design the device for the highest output impedance because then all the other impedance requirements will result in a lower input emf, which will not stress the magnetic design.

Turns ratio and impedance ratio

We know from Lenz's law that, until we approach saturation in the magnetic circuit, emf is directly proportional (by the factor 'k') to the number of turns (N). If we denote the primary with subscript 1 and the secondary with subscript 2, we get:

$R_1 = E_1 / I_1$ and $R_2 = E_2 / I_2$ (1) Ohm's law

$E_1 = kN_1$ and $E_2 = kN_2$ (2) Lenz' law

$I_1 = k/N_1$ and $I_2 = k/N_2$ (3)

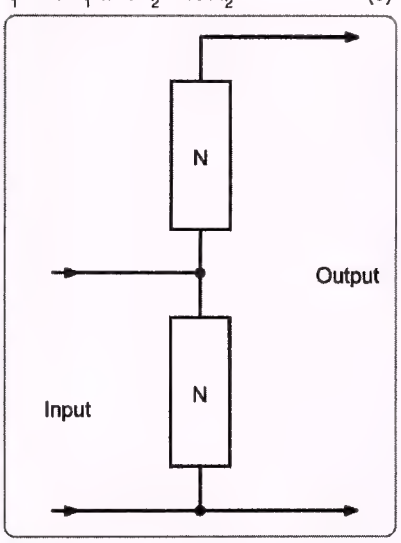


Figure 9: A 4:1 unun auto-transformer.

(Equations 3 follow directly from Ohm's and Lenz's laws; that is, current is inversely proportional to emf in a constant impedance circuit. And factor 'k' is the same in all equations because the magnetic circuit is common to all).

If we now set equations 1 as a ratio, we get:

$R_1 / R_2 = E_1 I_2 / E_2 I_1$ (4)

Substituting equations 2 and 3 into **equation 4, we get:**

$R_1 / R_2 = (kN_1 k / N_2) / (kN_2 k / N_1)$
$= (N_1 / N_2)^2$ (5)

In words, equation 5 tells us that the primary to secondary *impedance ratio* is equal to the square of the *turns ratio*. This formula applies to ALL transformers.

In Figure 9, we have an unun with an N-turn primary and a 2N-turn secondary.

It is an autotransformer design because the primary and secondary have one common lead, and neither the input nor output can be balanced. You can easily realise this design by winding two conductors in parallel, also known as bifilar winding. The impedance ratio, primary to secondary is 1:4.

How could you make this into a 1:1 unun? It just requires a slight rewiring, as in Figure 10.

Though Figures 9 and 10 are both auto-transformer designs (because their primary and secondary windings have a common connection), an unun does not have to be an auto-transformer. For example, consider Figure 11:

If the primary and secondary are wound as two parallel conductors (bifilar wound), this would be a transmission-line transformer. If the primary and secondary are both unbalanced, it would be an unun; if both the primary and secondary are balanced, it would be a balbal. You can now work out what a balun would be like.

How about a 1:1 balun with common leads? See Figure 12.

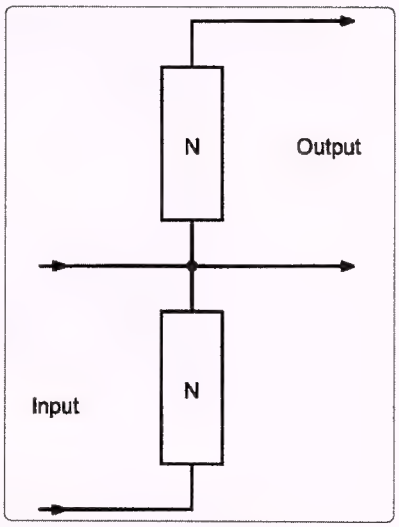


Figure 10: A 1:1 unun auto-transformer.

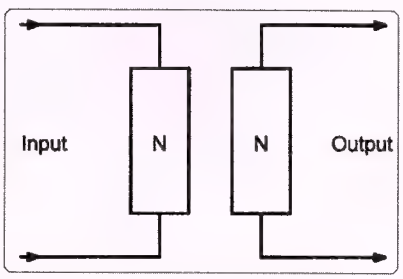


Figure 11: A 1:1 transformer with isolated primary and secondary.

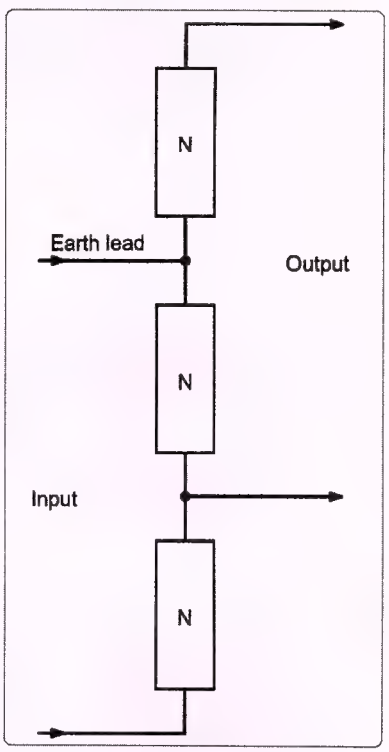


Figure 12: A 1:1 transformer with non-isolated primary and secondary.

You can realise this as a trifilar-wound auto-transformer, but now the output is balanced with respect to the upper input lead (labelled Earth). However, it is not an isolated design, because of the common connections. So, 'balanced' does not imply isolation of output from input.

You can realise other impedance ratios by going to quadrifilar winding or even higher. Alternately, as with mains transformers, you could wind different numbers of turns on the primary and secondary. But if you do this, you need to be careful that the total length of the wire on none of the windings approaches λ/2 - the frequency at which this occurs will have zero output. So, use short windings.

But the higher ratios become more difficult to wind; so, it is often better to achieve a high ratio by using two transformers in series. For instance, if you want an impedance ratio of 16:1, use two 4:1 transformers. Just remember, the two transformers cannot be the same because the input impedance required for the second transformer is quite different from the input impedance of the first as it must match the output impedance of the first transformer. For instance, if you wanted to connect to a high impedance off-centre-fed antenna with 50 Ω coax cable, you could use a pair of 4:1 ununs, the first going from 50 Ω to 200 Ω and the second from 200 Ω to 800 Ω.

Construction materials and methods

In an earlier part of this series of articles, I mentioned the core heating / magnetic saturation problems that arise when a 60 Hz transformer is operated at 50 Hz, or a 220 V transformer is operated at 240 V. Of course, with any real transformer there are losses. It would be nice to use air-cored baluns because then magnetic saturation could never occur, but the physical size would be burdensome and the likelihood of approaching λ/2 wire length in the windings increases. So we use magnetic cores - mostly ferrites.

Ferrites have a frequency-dependent permeability, μ, which is high at the LF end, relatively flat in the middle range and then falls off at the HF end. At the LF end we need to be concerned about magnetising losses and at the HF end, the inter-turn capacitive losses. At the HF end there will be sufficient inductive reactance in the winding that we can ignore magnetising losses and the risk of reduced permeability. Even when the initial permeability falls as frequency rises, the ferrite core can be used as a former for an 'air-cored' inductor/transformer primary.

Auto-transformer vs transmission line transformer

Auto-transformer

The inter-winding capacitance results in reduced bandwidth. And the best efficiency mid-band is often less than 95%.

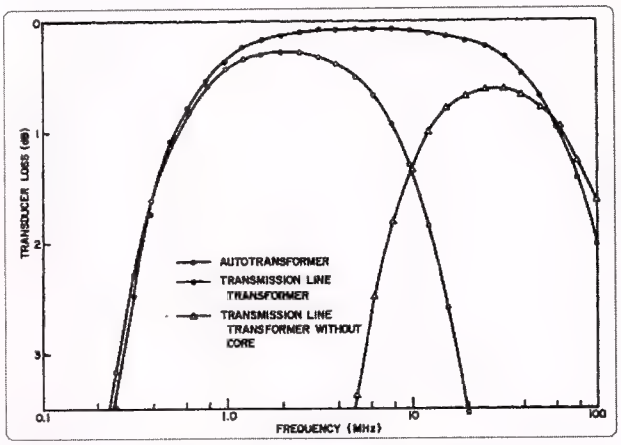


Figure 13: Transformer performance vs winding style (Sevick, 1991:3-12).

Transmission line transformer

This is a broadband device - you can more than cover the amateur radio HF bands with one TL transformer. And the efficiency is greater than 99% for most of the pass-band.

Here is a typical set of curves comparing the auto-transformer and the TL transformer:

Figure 13 shows that the TL transformer has a broader pass-band and higher efficiency than the auto-transformer. The curve 'without core' demonstrates the small effect resulting from reduced core permeability at the HF end, and the massive loss at the LF end.

For these reasons, I will stick with transmission line transformers from here on.

What characteristic impedance (Z_0) is needed inside the balun/unun?

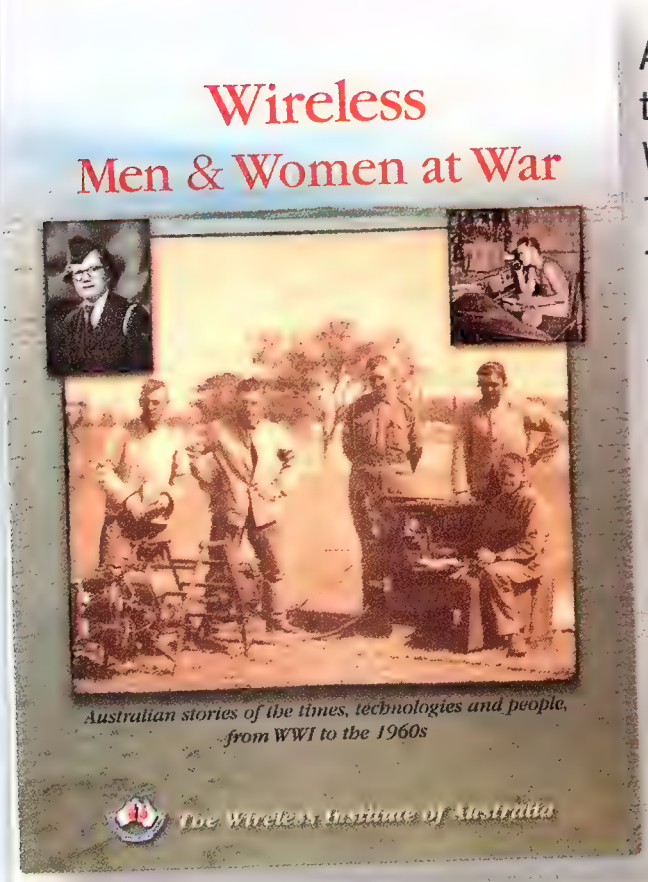
We have discussed input and output impedance. What we are concerned with now is the impedance of the transmission line (TL) **inside** the balun/unun. Here, we use the normal TL transformer equation. This internal TL impedance should be the geometric mean between Z_{TXVR} and Z_{ACU} (when feeding a balanced ACU directly at the transceiver) or between Z_{TXVR} and Z_{AE} (when feeding such antennas as the OCF dipole, 5λ/8 vertical or Yagi directly from the transceiver).

Some examples

- If Z_{TX} and Z_{ACU} both = 50 Ω, Z_0= 50 Ω. Easy - use 50 Ω coax.
- If you try to feed an OCF dipole or 5λ/8 antenna, when Z_{TL} = 50 Ω and Z_{AE} = 200 Ω, then Z0 = √(50 x 200) = 100 Ω. Here you could use two parallel lengths of 50 Ω coax with only their shields bonded (*ARRL Antenna Book*, 1995:21.16) or see below.
- If you want to feed a 3-element Yagi antenna, where Z_{TL} = 72 Ω and Z_{AE} = 18 Ω, then Z_0 = 36 Ω. You could use strip-line for this.

Part 4 continues next issue, with "How to roll-your-own.

Wireless Men & Women at War



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Newcomers' Notebook

The power and the glory of Ohm's Law, and the wonder of components in series and parallel

Jules Perrin VK3JFP

Way back in 1827, a German physicist, Georg Ohm (1789-1854), published a paper on his electrical experiments. The result is Ohm's Law and the identification of electrical resistance that bears his name.

His research found that every electrical component, or indeed any item, has a 'natural resistance' to electrical current flow. This natural resistance means that all these items that conduct electricity will dissipate some form of energy as heat measured in Watts, which naturally, is and named after James Watt (1736-1819).

Two other electrical units are tied-up in Ohm's Law - the volt and the Amp (aka 'ampere' in formal terms).

The volt is named after the Italian physicist Alessandro Volta (1745–1827), while the amp is named after André-Marie Ampère (1775–1836), a French physicist and mathematician.

While studying for your amateur licence, Ohm's Law along with the related power formulae, would be one of the first topics covered. Fortunately, we don't need to get drawn into the mathematics of the three physicists of yesteryear as the connection between the volt, resistance and power can be explained without complex mathematics such that we can use it every day. See **Figure 1** as a reminder.

But what makes the Ohm, Volt, Watt and Ampere the same here in Australia as it is in any other country?

All these units are defined by the International System of Units, known by the international abbreviation SI. Under the SI, there are seven base units and 22 derived units. The four units covered in this article are listed under the SI.

- **Ampere** (A) A base unit calibrated by the flow of a quantity of electrons over time.
- **Volt** (V) A derived unit from the potential to move one Ampere.
- **Watt** (W) A derived unit from the rate of work.
- **Ohm** (Ω) A derived unit based on the Volt and Ampere (Ohm's Law).

The SI web site in Wikipedia is worth a visit to explore how many of the measurement units are derived (enter: International System of Units).

Back to the triangle, use a finger to cover the unit you want to calculate and the position of the remaining two units gives the formula. Example: If we want to know the current, cover the I, which leaves 'E over R' (E divided by R).

So, the current flowing in a circuit pushed by 12 Volts DC through a 10 Ω lamp would be

I = 12 VDC / 10 Ω = 1.2 A

Using the PIE formulae, what energy is dissipated by the 10 Ω lamp above?

P = 1.2 A x 12 VDC shows that the resistor dissipates 14.4 W.

I think this is the wattage of an incandescent parking light in a car.

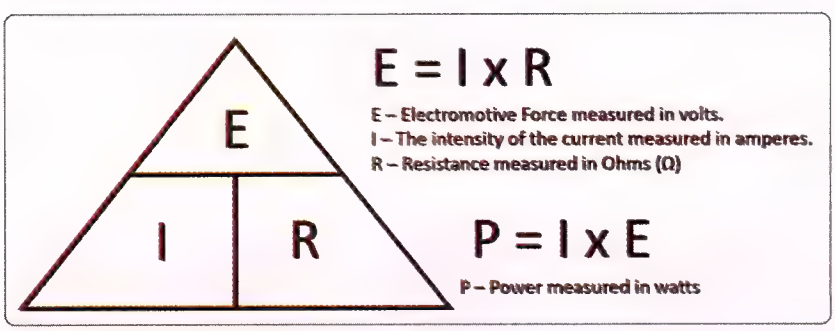


Figure 1. *The Ohm's law triangle illustrates the relation between voltage, current and power.*

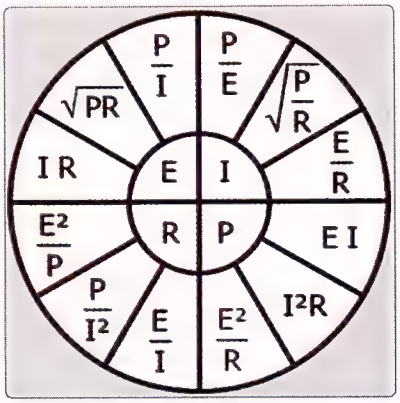


Figure 2. *The Ohm's Law Wheel – a very useful thing to keep around the workbench.*

Using a combination of the triangle and the PIE formulae, most calculations related to DC voltage, current, resistance and power in our hobby environment can be done easily.

Going further

There are more complex formulae to calculate the power from resistance, voltage and current. These can be seen in the Ohm's Law Wheel at **Figure 2**. I have a copy on my quick reference sheet that I use in the shack. A copy of the reference sheet can be downloaded from my website, here: *www.julesworkshop.net/amateur%20radio.html*. It's the top link.

The Ohm's Law wheel can be handy. For example: if there is a 10 Ω resistor dissipating 10 Watts, what is the DC voltage across the resistor and what current is flowing through the resistor?

Answers are: 10 V and 1 A. Use the wheel to see how these results are obtained.

Series and parallel

Components in series or parallel would be one of the first topics when studying to upgrade your licence. Knowing how to calculate the impact these configurations have is important.

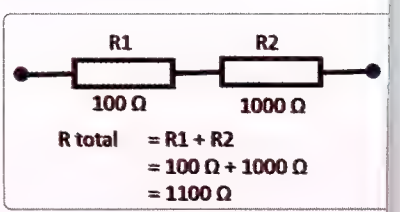


Figure 3. *Calculating the value of two resistors in series.*

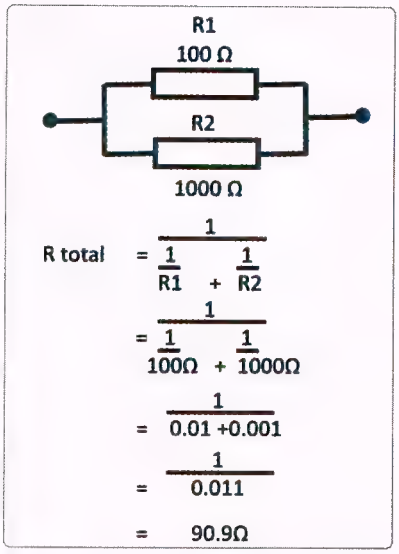


Figure 4. *Calculating the value of two resistors connected in parallel.*

The arithmetic is simple, so just take it one step at a time. Also, ensure you are working with the same prefix in the description. Do not mix, for example, M-ohms (megohms) with k-ohms (kilohms).

Resistors in series

The current path for series resistors travels through one resistor then the other. Calculate total resistance in series by adding the resistances. In **Figure 3**, R2 is the greater value resistor and will have the largest impact in restricting the current flow.

Resistors in parallel

The current path for parallel resistors will split proportionately through the resistors. In **Figure 4**, R1 is the smaller value resistor and hence will have the larger current flow through it. As the relationship of the resistors to each other is proportional, the reciprocal of the resistor values is derived then added.

Do not be daunted by the calculation, just start with the bottom division at each level and work up as shown. The resulting value will always be less than the smallest resistor value.

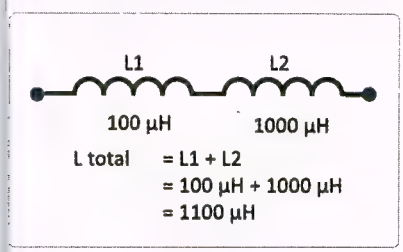


Figure 5. *Calculating the value of inductors connected in series.*

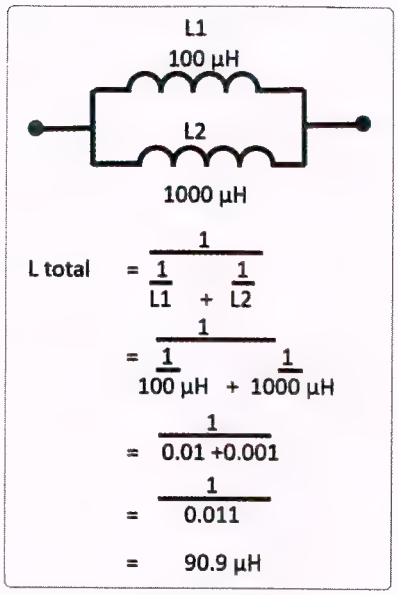


Figure 6. *Calculating the value of inductors connected in parallel.*

The same method works for calculating the values of other basic components connected in series or parallel.

Inductors in series

Inductors in series are calculated the same way as resistors in series – just add them, as in **Figure 5**.

Inductors in parallel

Again, the same calculation method applies as for resistors. See **Figure 6**. The result will always be less than the smallest value inductor.

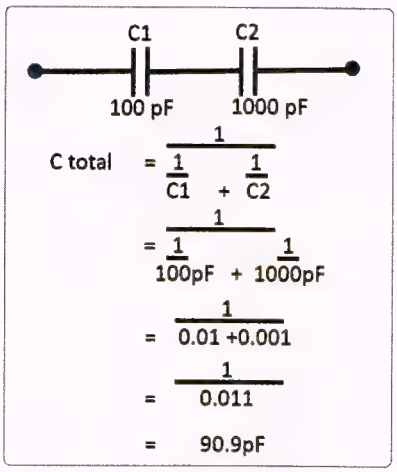


Figure 7. *For calculating the value of capacitors connected in series, the method is the same as for resistors in parallel.*

Capacitors in series

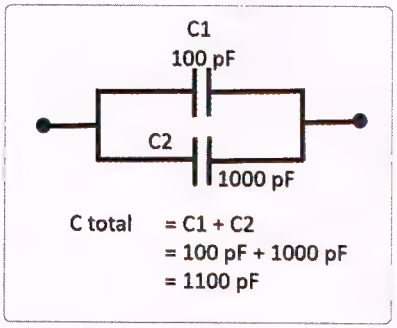


Figure 8. *Capacitors in parallel – simples – just add the values!*

Just when you thought you had everything sorted, along come capacitors just to throw a spanner in the works. The calculations are the same as before, just flipped!

So, the calculation for capacitors in series is the same as resistors in parallel. The result will always be less than the value of the smallest value capacitor, as in **Figure 7**.

Capacitors in parallel

The method of calculation for capacitors connected in parallel, is the same as for resistors in series. **Figure 8** shows how.

Try out a few calculations for yourself and the formulas will not be so daunting as you may have originally thought.

Memorisation

Memorising formulae can be helped by a mnemonic or a 'ditty'. There are several such reminders to help remember the resistor colour code (Google them). I remember the power formula $P = I^2 \times R$ as follows: *Twinkle twinkle little star, power equals I-squared R (I^2R).*

It never ceases to amaze me the number of people working in electrotechnology that do not have a fundamental understanding of the basics. When understood, circuit theory – for which this topic forms the foundation – makes it possible to comprehend all the more advanced subjects encountered in electrical and electronics.

Have fun and stay safe.

Meteor Scatter Report

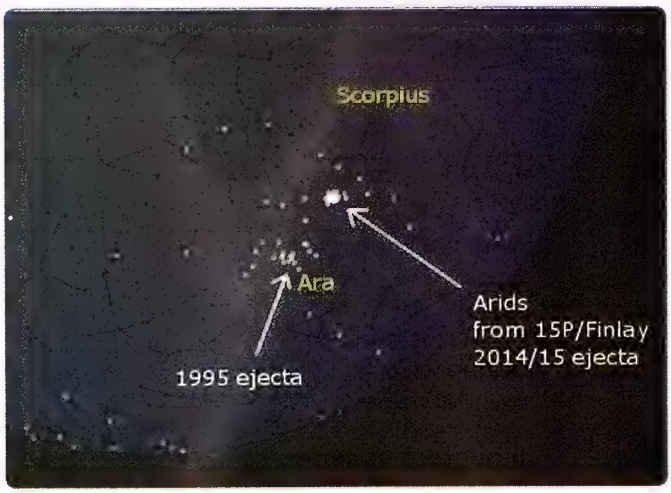
Dr Kevin Johnston VK4UH
e *vk4uh@wia.org.au*

New meteor shower

This Issue: Seasons Greetings; New meteor shower; more software upgrades; G4WJS-SK; forthcoming events and showers; meteor scatter activity schedules.

It is rare to be able to report something completely new, but here we have it. Briefly touched on as breaking news in the last column is news of a completely new and previously unreported meteor shower.

As has been described in many previous articles, a meteor shower is a period of significant increase in meteor numbers producing both visual sightings and enhanced meteor scatter propagation. Many such showers have been recognised for century's and recur on the same and highly predictable dates each year.



Celestial location of Arids, near the constellation of Ara.

Meteor Showers occur when the orbit of the Earth around the Sun takes our planet through tracts of debris remaining from the passage of comets or asteroids across our own solar system. Since these tracts are, for all intents and purposes static in space, at least in relation to our own solar system, the Earth passes through them on exactly the same date each year (note 1) since it is our position in our orbit around the Sun that actually determines the date.

During showers, meteors 'appear' to emanate from a single point in the sky called the ZENITH. Traditionally, meteor showers are named by astronomers according to the constellation of stars also seen at the zenith point on those specific dates. Star constellations also appear to return to the same point in our sky on the same date each year for the same reason. Of course, it is the Earth in its solar orbit that is moving, not the position of the stars.

It has been reported by astronomers recently that an entirely new shower occurred for the first time late in 2021. It occurred as a result of the Earth passed though the dust clouds remaining after the passage of tiny comet 15P/Finlay around the Sun.

According to Professor Jonti Horner from the University of Southern Queensland, "Comet 15P/Finlay apparently comes from around Jupiter and swings around the Sun once every six years. The nucleus of this 'dirty snowball' is only about 2 km in diameter." The comet itself was discovered over a century ago but initially was not identified as the source of a meteor shower. It was tracked as it passed around the Sun in 1995, 2008, and 2014, but this year was the first time the Earth has passed through its 'dust tail'.

Until such time as the recurring date next year is identified, the meteor shower has been dubbed by some authorities as the "Finlayids", being named after the parent body rather than a star constellation. Other authorities have provisionally named the shower as the ARIDS, named after the tiny constellation of ARA (the Alter), a small constellation of stars between the Southern Cross and Sagittarius (the tea pot). The shower has been officially added to the International Astronomical working list of Meteor Showers.

Best predictions placed the optimum date between 29 September and 7 October, although this may not be accurate. The ZHR (Zenith Hourly rate) is unknown as yet, but is likely to be around 13-15/hour. To be clear, it remains unknown at this stage if the shower will recur or not next year, or the date or the ZHR – we will have to wait and see.

It is thought that 'new showers' like the Arids may not stabilise straight away and may appear and disappear over a number of

years. But *please* could everyone look back though their logs and see if there was any enhancement of meteor scatter propagation on or around dates between 29 September and 7 October last year. We will have to wait until Sept-Oct this year to know for sure.

Software updates (G4WJS-SK)

Sadly, this issue comes news of the unexpected passing of WSJTx Development Group Member Bill Somerville G4WJS. Bill had been part of the Development Group since 2013 and had been closely involved in code writing, user interface development, and the overall program structure. His influence will have touched virtually every meteor scatter operator in one way or another.

Just last edition, I advised that a further General Release (GA) of WSJTx (ver. 2.5.0) had been announced. There has been ongoing progress. Since that last column went to press, further general releases have been announced. Now up to WSJT-x ver. 2.5.3 (currently only available in Win 64 and macOS) and WSJT-x ver. 2.5.2 for all other operating systems. It is likely that ver. 2.5.3 for other OS will become available in due course.

I have yet to try the new version and, as always, new software versions and User Guides can be downloaded from the usual source *https://physics.priceton.edu/pulsar/k1jt/wsjtx.html*

Early review suggests that the new versions do not include any significant changes to the meteor scatter modes, much of the new development being concerned with enhancement to Q65 and MAP65 modes. As always, users are encouraged to read the release notes before employing new software versions on-air.

Current activity and forthcoming showers

As this column is being prepared, the highly anticipated Geminids Meteor Show is only a few days away. Sadly, curtesy of a direct lightning strike to a tree directly behind my shack and QTH, I will no longer be participating this year. VK4UH is currently off-air having suffered significant damage and loss of a number of radios, amplifiers and other shack accessories, as well as a raft of electronic failures in the house. Mercifully, no structural damage occurred to the QTH, no fires and no injuries – reasons to be grateful.

The first significant shower event in the New Year is the Quadrantids, peaking around 4 January. A major shower with a ZHR of 120/hour but with a very short duration (a few hours only). The outlook is poor and this shower is typically a non-event.

After that, there is little meteor shower activity until the Lyrids at the end of April (peak on 22nd). This shower is induced by debris from comet C/1861 G1 (Thatcher). Predicted ZHR is 18/hour.

Weekend activity sessions

The weekend MS activity sessions run on Saturday and Sunday mornings, from before dawn (around 20:00 UTC or earlier) until propagation fails.

- Focus frequencies: 2-m – 144.230MHz; 6-m – 50.230MHz.
- Current Preferred Mode: MSK144 Version 2.0, running 15 second periods.

In VK, we have a well-established protocol for which call areas use which transmission period during these weekend activity periods:

- Southerly stations (VK1, 3, 5, 7) always run 1st period beaming North.
- Northerly stations (VK4) always run 2nd period beaming South.
- Stations in the middle call areas – VK2 and VK1 – change period, depending on the day.
- Saturday run 2nd period beaming South; Sundays run 1st period beaming North.

Register with VK-ZL Meteor Scatter Facebook Page (closed group of AR operators) for up to the minute advice and information.

Meteor Scatter operators are encouraged to monitor and post on the VK-Spotter site (https://vkspotter.com) during the activity sessions.

Next edition

Next issue: a planning guide and diary for meteor shower operation through the year and some thoughts on incorporating meteor scatter and other digital modes into VHF Contest and Field Day activities.

And finally

"The time has come the Walrus said ....." or at least Lewis Carrol wrote in his famous poem. I have now been writing this column for the best part of ten years and I feel that the time is right for a changing of the guard. Having recently retired from medical practice and the imminent relaxation of covid-19 related travel restrictions, it is time to take some time out to follow some of our life plans. Is there someone amongst the readership who might consider taking up the baton and the column for the future – or at least for a while?

I wish to offer the best of good will and successful operating and propagation to everyone through 2022. We have all been through some very challenging times. Let us hope that 2022 is better for everyone.

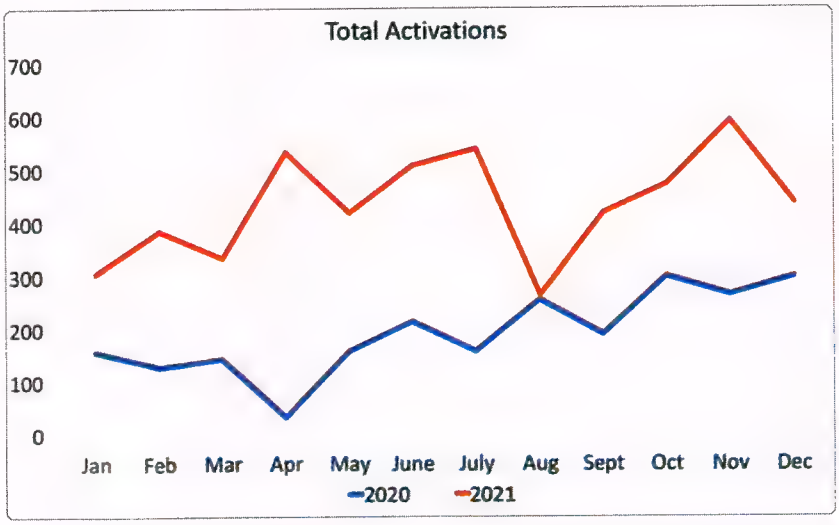
Contributions for this column are as always welcome.
Email *vk4uh@wia.org.au*.

Note 1.

It is the movement of the Earth through the dust tracts remaining after the passage of comets and asteroids that is responsible for the regularity of meteor showers. On those dates, it is the Earth's gravitational field effectively 'vacuuming-up' and ablating extra-terrestrial dust as it passes through the remaining cloud that causes the meteor shower.

SOTA and Parks

Allen Harvie VK3ARH
e *vk3arh@wia.org.au*



2021 – the year in review

This was our second year of COVID restrictions. Glad to report that, instead of sitting at home waiting for new toys to be delivered, this time was not wasted as we introduced new activities – SiOTA, HEMA and ZLOTA – updated existing awards (SOTA and POTA) and improved our skills (home brew / CW). As restrictions eased, we got out and activated with vengeance.

The Total Activations chart here shows activations for the primary activity for 2020 compared to 2021. As you can see, apart from August (hmm, weather?), activity increased across the board. Let's have a closer look at 2021, illustrated in the 2021 Activity chart, here.

As most sites qualify for multiple classes (ie, a SOTA summit in a WWFF park or a park that also qualifies for WWFF, POTA and KRMNPA), this chart shows the activity for the primary class and included new classes as they came on line.

Highlights

The year always starts and finishes with great enthusiasm as SOTA activators get out for New Year rollover. As activators can only claim points for each summit once per calendar year (chasers can claim points for each summit daily), so the New Year UTC rollover presents an opportunity for activators to claim points for activation both pre and post UTC (11:00am for AEDT), an activation in two different years.

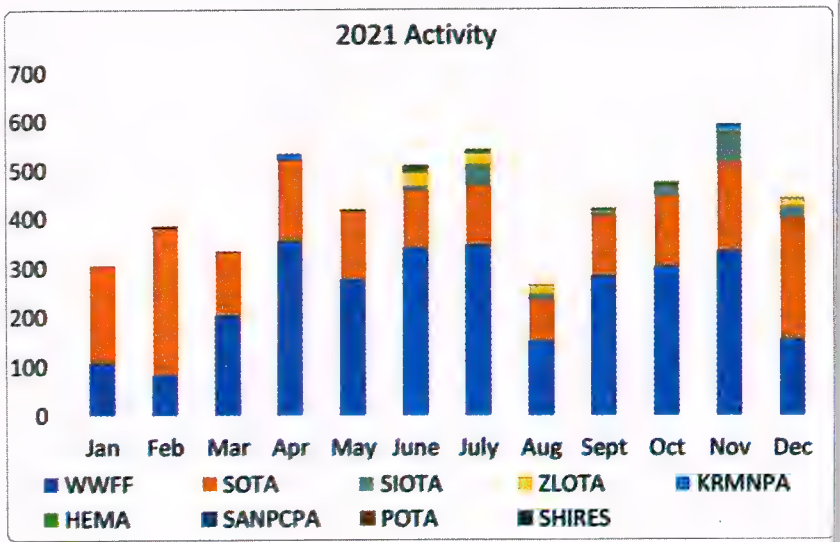
Many took advantage of both this and the milder weather to activate. As a result, many positioned themselves in high-scoring or remote summits. This year was no different with 40+ activators activating 50+ summits over VK and ZL, which leads to summit-to-summit (S2S) opportunities aplenty. This was consistent with 2020 levels and reflects the lack of COVID restrictions at that time.

The annual Hotham SOTA-fest (4-7 Feb) was again well attended despite rolling COVID lockdowns and, with the area receiving 130 mm rain in the week running up, bringing additional challenges. In fact, the timing was perfect as the window allowed interstate activators to attend and return between state border closures.

Again, we adapted to the conditions and qualified everything we could access. As I write this, the exact timing and location for Hotham 2022 is still being verified but expected to go ahead.

VK1 was able to host the SOTA Winter QSO Party with interstate chasers. Various attempts to align UK, EU, VK and ZL SOTA activations were derailed due to domestic and international COVID constraints, with December finally allowing such an activity to go ahead.

The Keith Roget Memorial National Parks Award (KRMNPA) Activation Weekend (12-15 Nov), normally held in Spring but, again due to travel restrictions moved to Autumn, went ahead. While expecting around 20 KRMNPA



activations, we ended up with 48 (29 unique parks that qualify for KRMNPA) and interstate activators coming to the party with over 110 WWFF activations, including Paul VK0PD from Casey Station, Antarctica. Most activity has been on 40-m SSB with some CW on 80-m, 40-m and 20-m, plus one activation using JS8call. More info at: *www.amateurradio.com.au/awards*

The new awards kept Sue VK5AYL (iOS PnP – *www.vk5ayl.com/*) and Peter VK3ZPF (VK port-a-log - *http://vk3zpf.com/vk-port-a-log*) busy with both spending time during lockdowns to update and enhance their respective applications and release new versions for us to use.

VKFF Weekend (27-28 Nov) saw record levels of participation. There were 67 activators out getting 126 parks activated. The activity was not limited to activators, with 4652 contacts recorded; 2032 of these were park-to-park (P2P). More details can be found at the WWFF website: *www.wwffaustralia.com/vkff-activation-weekend.html*

New and updated programs aplenty

2021 saw new programs launched for portable operation in VK and ZL. These supplement the existing awards bringing more opportunities to the table for activators and chasers alike due to overlapping activation areas.

SiOTA, introduced in mid-2021 (see accompanying panel), provided opportunities for many operators to get out and comply with travel restrictions due the location of the sites and ability to operate with mobile setups. Activity is increasing as travel restrictions have been lifted and by those keen to bag a '1st activation' or just plain enjoy radio. Marc VK3OHM continues to add new sites to the activity. More details on: *www.silosontheair.com/about.html*

HEMA was introduced with VK1, VK3 and VK5 coming online. This award brings summits lacking the prominence to be included in SOTA to the table. I was able to pick up some local hills, thus completing all the local hills. More info at: *http://hema.org.uk/awardsWebsite.jsp*

POTA was introduced for VK, with Marty VK4KC aligning local sites. There are opportunities aplenty for local and DX contacts, especially with our US friends. More info from: *https://pota.app/#/*

ZLOTA was revamped, with Matt ZL4NVW working to align the many and diverse sites. This is a great program for ZL and keenly chased from VK. More info at: *https://ontheair.nz/*

I have noticed an increase in interest for WWFF and SiOTA opportunities. With so many awards, the chances of a site included in two (if not more) are increasing. The biggest challenge will be getting the logs to the right people for processing. To find such opportunities, you can use 'close to me' (*https://parksnpeaks.org/viewTools.php*) to locate sites near you (or enter a lat / long), then hunt check for activation zones using Google Earth by downloading boundary files (*https://parksnpeaks.org/viewMaps.php*) to verify the ideal operating position.

Anyway, again, charge your batteries, review your maps then go out there and get amongst it.

73 & 44

Allen VK3ARH

I also want to thank Peter VK3ZPF for adding SiOTA to VK port-a-log and Allen VK3ARH for adding SiOTA spotting to the ParksnPeaks website.

Silos on the Air

Megan Woods VK3TIN
www.silosontheair.com

Marc VK3OHM and I soft launched Silos on the Air (SiOTA), on or about the 12th of April 2021, which predates the more official announcement and discussion in Volume 89 No 4 of AR magazine (published 14 July 2021). Since that launch, as of 26 December 2021, we now have 74 active VK callsigns registered, 2098 logged QSOs and a total of 158 successful silo activations.

SiOTA originally launched with a simple scoring system based on the number of silos activated, but feedback from the chaser community was that activators were not sticking around at the silos long enough before moving on, so scoring was updated to include the average number of QSOs that the operator had logged per silo for the current calendar year.

This change to scoring rewards, as a multiplier, the activator for working as many QSOs as they can. This directly translates into more time on air and more fun for both chasers and activators.

Before diving into the numbers, I want to take a moment to thank both our activators and our chasers, without your involvement there isn't a program.

Statistics as of 26 Dec 2021

Top by score:
VK2YAK (463.92), VK5PAS (311.98), VK3ZPF (251.04)

Top by silos activated:
VK2YAK (24), VK5PAS (19), VK2YK (18)

Top by average QSO/Silo:
VK2IO (35), VK2VH (20), VK2YAK (19.33)

Top QSO Silos to Silo:
VK4MGL (19), VK2YAK (12), VK2IO (9)

Top chasers by QSO:
VK3ZPF (142), VK2VW (114), VK3OHM (96)

Activations by state:
NSW (58), VIC (45), SA (32), QLD (17), TAS (4)

Total Silos: 923
Total silos by state: NSW (339), VIC (298), SA (111), QLD (83), WA (81), TAS (8), NT (3)

de VK3TIN

ALARA

Jenny Wardrop, VK3WQ
e secretary@alara.org.au
w www.alara.org.au

As I write this, Christmas is over and the New Year is only a few days away. I hope that your Christmas was joyous and that the New Year will be a healthy, safe, and happy one for all.

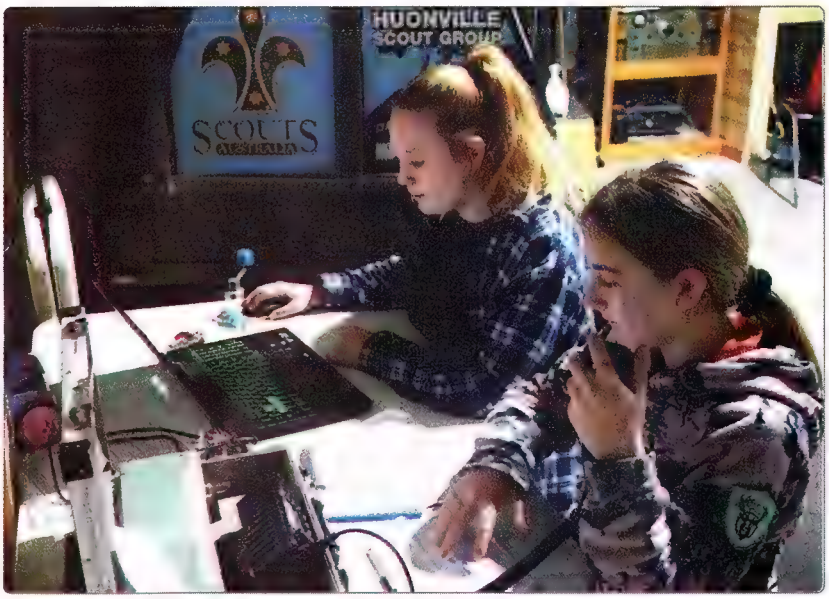
Now, here is the news that I'm sure you have all been waiting for! **The next ALARAmeet will be held in Tasmania, probably Hobart, in 2023.** After the disappointment of the 2020 and 2021 meets being cancelled due to Covid 19, we can only hope that this one will go ahead without any major problems. The ALARA Committee has agreed to commence planning for 2023 and our current President, Linda VK7QP, and Treasurer, Catherine VK7GH, will head up a team, membership yet to be decided upon. We will keep you informed as information comes to hand.

For this issue's column, among other things, I was very pleased to receive information on some very active YLs, a few of whom are quite young.

VK7HSD, Huonville electronics and radio team (HEART)

On Friday 10 December last, Linda VK7QP and Justin VK7TW were invited as special guests to the end of 2021 Huonville Scout presentation night to unveil and present some special radio related prizes.

There has been something very special going on at Huonville Scouts thanks to Dale VK7FNED, Michael VK7MRS, Brian VK7BM, Nicole VK7FNJS, and Jackson VK7FJAX. This group started a Radio Patrol program that is now going gang-busters with well over ten scouts gaining Foundation licences and actively participating in radio related activities.



YLs contesting! Lakia VK7LJB on the computer and Aiva (callsign pending) on the mic during the 2021 ALARA Contest, held over 28-29 August last year.

Michael and Brian do a fantastic job training-up the scouts each week prior to their normal scout activities. Then, Justin VK7TW comes along and takes them through their theory and practical assessments.

Last year, for the first time, scout and guide groups were invited to take part in the ALARA Contest. Two young women, Lakia VK7LJB and Aiva, teamed up to gain a top score for a Foundation licence in the contest. The Tigers team – VK7HSD – gained an honourable mention and Linda VK7QP congratulated the Radio Patrol on their achievements.

The District Commissioner of Scouts then unveiled the *Huonville Scout Group Licensed Amateur Radio Operators Plaque*, which contains the names of the 12 recent Foundation licensees. It is to be mounted in the main hall for all to see and for other scouts to aspire to become involved in the Radio Patrol and its activities and get their names added to the plaque.

Linda and Justin then presented handheld rigs to three of the recent Foundation licensees.

It was a lovely evening to be surrounded by scouts and their families celebrating their successes. Congratulations to all involved in this fantastic venture.

73, Justin VK7TW and Linda VK7QP

Juliet VK3JUL and daughter Bibby VK3BIB with their Graduation Certificates from BAREC's Amateur Radio Training Program 2020-21.

Two new YLs for Bendigo Club

Some good things have been happening in Bendigo. As a young girl just nine years of age, Bibby first came to the attention of Bendigo Amateur Radio and Electronics Club (BAREC) back in 2019.

Bibby VK3BIB working SOTA at Mount Tarrengower, 36 km southwest of Bendigo, on 30 November last, in the company of BAREC Members.

Encouraged by her mum, Juliet, she already had a strong interest in robotics and was persuaded to deliver a presentation on that subject to BAREC's members at Castlemaine Scout Hall, where Juliet is a leader.

Both Juliet and Bibby subsequently graduated from BAREC's Amateur Radio Training Program in 2020-21, and took up the callsigns VK3JUL and VK3BIB, respectively. Bibby's latest effort is as assistant net controller for BAREC's weekly VHF net.

These two new YLs reflect BAREC's commitment to encourage women and girls to take up STEM careers using Amateur Radio as a launch-pad.

Neil Patton VK3ZVX
President BAREC

DMR anyone?

From Linda VK7QP, I have received this: "Shirl VK7HSC and I have DMR rigs. DMR stands for Digital Mobile Radio. Shirl bought her radio a couple of years ago at Tasmania's Miena Hamfest. Scott VK7HSE has been kind enough to lend me one, a Radioddity GD77. Are there any other ALARA members on DMR? I'd love to have a chat.

"It is possible to talk all round Australia with a small DMR handheld. While it is a bit techy to set up, it is not as expensive as HF and does not require large antennas. Please get in touch if you have DMR or if you are interested in getting into it."

Linda Luther VK7QP
President, ALARA

Over to you

Titling of VK3AQZ antenna tuner project series

Hi Roger,

Just read my pdf copy of the latest AR mag – very nice, thank you.

I was one of the respondents to the survey and made a remark about needing more proof readers before the magazine went to print, so I respectfully point out the following regarding the title of a series of articles:

AR Edition 3 – 2021
The VK3AQZ HF antenna tuner project
Part 1 First article

AR Edition 4 – 2021
The VK3AQZ HF antenna tuner project
Part 1 Second article of Lou's ATU project

AR Edition 6 – 2021
The VK3AQZ HF antenna tuner project
Part 1 Third article of Lou's ATU project

Either I've got this wrong or Part 2 is some extra add-on to the project or else somebody is not on the ball.

Having edited CQ-DATV magazine for quite a few years, I am well aware of the problem of not seeing the wood for the tree's when it comes to this sort of thing.

One other note, my pdf copy has an extra page at the end that says - "Endnotes" (rest of the page is blank).

Cheers, Terry VK5TM

Hi Terry,

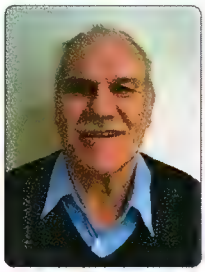
The titling of Lou's series of articles in this way is deliberate.

You will find that it began (so far as I can determine) back in 2019 with the first of Lou's HF Transceiver Project series. Take a look at his transceiver series through 2020 – Issue 1 (Jan/Feb), p.8, ". . Part 1 Receiver second article".

The author provides his article series in complete 'sets' – Part 1, Part 2, and so on. But these 'parts' are huge, taking 20-plus magazine pages. That's a third of the available pages in an edition of the magazine (pages 1, 2, 3 and 64 are 'unavailable'). Hence, Lou's article parts need to be divided. Even so, there are readers that complain such articles take up too much room ("too technical / not technical enough") when other topics could be published (DXpeditions, club socials, etc). As you would appreciate, it's a matter of judging the balance.

I might point out that the practice was instituted by a previous editor. However, I decided to continue it with Lou's latest series on his ATU.

Thank you for participating in our readers' survey and for raising this issue, providing an opportunity for me to explain it.



DX Awards

Marc Hillman VK3OHM/VK3IP

All users of the WIA Online Awards system please note that, from 1 January 2022, the opt-out mechanism for the DX Leaderboard has changed.

At the beginning of the year (1 January), you were opted-in automatically to the Leaderboard for the calendar year. From your profile, you will have the option to opt-out for the current calendar year. Once you opt-out, you cannot opt-in for that year. This means you will be invisible for the rest of the year and you cannot opt-in at the last minute.

Below are listed all new awards issued from 2021-10-15 to 2021-12-14.

To use the online award system, go to: *www.wia.org.au/members/wiadxawards/about/*

New awards

Antarctic

#	Call	Name	Mode
128	VK5MAV	Andrey Mikhaylov	Open

DXCC Multi-band (3)

#	Call	Name	Mode	Band	Count
211	VK6EH	Wayne Johnson	Open	40-20-15m	424

DXCC Multi-band (7)

#	Call	Name	Mode	Band	Count
74	VK6DW	Ian Cook	Open	40-30-20-17-15-12-10m	1018
75	VK6APK	Aleksandar Petkovic	Digital	40-30-20-17-15-12-10m	948
76	VK2PW	Adam McCarthy	Digital	80-40-30-20-17-15-12m	1002

DXCC Multi-band (8)

#	Call	Name	Mode	Band	Count
38	VK2BY	Bradley Devon	Open	80-40-30-20-17-15-12-10m	1331
39	VK2BY	Bradley Devon	Digital	80-40-30-20-17-15-12-10m	1244
40	VK3GA	Graham Alston	Digital	80-40-30-20-17-15-12-10m	1560
41	VK6DW	Ian Cook	Open	80-40-30-20-17-15-12-10m	1131
42	VK3BDX	David Burden	Open	80-40-30-20-17-15-12-10m	1616
43	VK3BDX	David Burden	Digital	80-40-30-20-17-15-12-10m	1577

DXCC Multi-mode (CW)

#	Call	Name	Count
279	VK2BY	Bradley Devon	128

DXCC Multi-mode (Digital)

#	Call	Name	Count
145	VK6ML	Matthew Mcdonough	127

DXCC Multi-mode (Triple Play)

#	Call	Name	Count
25	VK2BY	Bradley Devon	101

DXCC Single-band

#	Call	Name	Mode	Band	Count
975	VK6DW	Ian Cook	Open	12m	102
976	VK3KE	Jim Baxter	Phone	40m	101
977	VK2BY	Bradley Devon	Open	10m	107
978	VK2BY	Bradley Devon	Digital	10m	104
979	VK3GA	Graham Alston	Digital	10m	100
980	VK6DW	Ian Cook	Open	80m	100
981	VK3NX	Charlie Kahwagi	Open	80m	100
982	VK3NX	Charlie Kahwagi	Digital	80m	101
983	VK6APK	Aleksandar Petkovic	Digital	10m	104
984	VK6APK	Aleksandar Petkovic	Digital	12m	109
985	VK6ML	Matthew Mcdonough	Digital	30m	101
986	VK6ML	Matthew Mcdonough	Open	30m	101
987	VK2PW	Adam McCarthy	Phone	20m	113
988	VK2PW	Adam McCarthy	CW	20m	103
989	VK2PW	Adam McCarthy	Digital	80m	102
990	VK3BDX	David Burden	Open	10m	101
991	VK3BDX	David Burden	Digital	10m	100

Grid Square

#	Call	Name	Mode	Band	Count
577	VK6BMA	Brian McAndrew	Open	HF	1081
578	VK6BMA	Brian McAndrew	Digital	HF	1081
579	VK4CAG	Graeme Dowse	Open	HF	1047
580	VK4CAG	Graeme Dowse	Digital	HF	1037
581	VK3XV	Tony Hambling	Digital	HF	275
582	VK5VAM	Alexander McCallum	Open	HF	100
583	VK5VAM	Alexander McCallum	Digital	HF	100
584	VK2SKI	Malcolm Warwick	Open	HF	465
585	VK2SKI	Malcolm Warwick	Digital	HF	464
586	VK6EH	Wayne Johnson	Open	HF	703
587	VK4CAG	Graeme Dowse	Open	6m	66
588	VK6ML	Matthew Mcdonough	Open	HF	1233
589	VK6ML	Matthew Mcdonough	Digital	HF	1233
590	VK4CAG	Graeme Dowse	Digital	6m	64
591	VK4CAG	Graeme Dowse	Phone	HF	120

IARU Worked All Continents (Basic)

#	Call	Name	Mode	Band
91	VK2RZ	Alexander Taverner	Open	
92	VK2RZ	Alexander Taverner	Digital	

Islands of Australia

#	Call	Name	Count
18	VK5MAV	Andrey Mikhaylov	36

Oceania

#	Call	Name	Count
68	VK3VTH	Tony Hambling	30
69	VK6EH	Wayne Johnson	54
70	VK5MAV	Andrey Mikhaylov	58

Worked All States VHF

#	Call	Name	Mode	Band
241	VK4CAG	Graeme Dowse	Open	6m
242	VK4CAG	Graeme Dowse	Digital	6m

Worked All VK Call Areas HF

#	Call	Name	Mode
2432	VK3ANL	Nicholas Lock	Open
2433	VK6APK	Aleksandar Petkovic	Open
2434	VK2IO	Gerard Hill	Open

Silent Key

Phil Orchard, VK3APO / VK2BTT

Phil on board the MV Cape Don in November 2010.

Phil discovered radio at school in the 1930s. He followed in the footsteps of his father, a marine Chief Engineer, attended the Melbourne Marconi School of Wireless for 12 months and qualified for a Commercial Operators Certificate of Proficiency.

In November 1941, having just turned 20, with his father present, Phil signed on as 3rd Radio Officer on the British ship Ettrickbank, the only Aussie onboard!

It was wartime and his first voyage was through the Suez Canal to Beirut with bagged wheat, then returning an Australian Army Transport Unit from Alexandria to Australia; initially, orders were to Singapore!

The second voyage, with a cargo of pig iron and wheat for Europe, was across the Pacific, through Panama to Guantanamo Bay. From Cuba, in company with 25 other ships, they sailed up the US east coast to New York. This was before formal convoy arrangements and ships would form a single file behind a minesweeper. U-boat attack was of serious concern!

Phil spoke of actually listening to the U-boats on the radio and witnessing an attack, and, in shallow water seeing masts of numerous sunken ships. He recalled their own radio procedures, the Ettrickbank's callsign, GDDS, and the secret wartime callsign if challenged, ZMAU!

In Halifax on 31 May 1942, the Ettrickbank joined convoy HX192 – 27 ships sailing for Liverpool, arriving 11 June. On this convoy, Phil described how radio watch-keeping was limited because U-boats were known to be listening for receivers' local oscillators.

Radio officers were expected to undertake communications within the convoy using flags and Aldis signaling lamps, and to share in the very important visual lookout. In Liverpool, the ship underwent a month-long refit; two weeks in dry dock. Also, a trip up the Manchester Ship Canal. Phil did an ack-ack gunnery course!

His next voyage was with convoy OS34 from Liverpool, departing 11 July 1942, to Sierra Leone, 35 ships arriving off Freetown on 30 July, with two lost! Cargo was general war material, including bombs for North Africa. Phil recalled being inside the radio room and the Mate describing the explosion of two nearby ships, and the sinking!

Proceeding south around the Cape and again through the Suez Canal, they delivered their cargo in Alexandria. Phil noted that, at the time, Rommel was only 70 miles away!

After bunkering in Aden, they were ordered to the Caribbean, to Trinidad, to load bitumen for airfield construction in Australia. An interesting cargo: large blocks separated by timber, to prevent it joining and becoming an unmanageable mass! Off Brazil, they rescued from a lifeboat the Mate and 19 crew from the British ship Marylyn that had been torpedoed by U-174.

They came back through the Panama Canal and across the Pacific, arriving in Melbourne in March 1943 to unload the bitumen at Fishermans Bend. Phil had been onboard for 15 months!

After leave and some local work, including a period on the Port Phillip pilot boat, Phil signed on the SS Anhui, doing four voyages over six months from Australia's east coast for the New Guinea campaign. There were numerous attacks by Japanese aircraft.

Then came a highlight of Phil's wartime seagoing experiences: he signed on the Trienza/ZEON with two other hams, the late Noel Roberts VK3NR, and VK3LT. They were all musicians, sailing in the South Pacific and the war had moved well away to the north. A happy time!

Peace, at last

With the end of the war, Phil swallowed the anchor, came ashore, married Bev, had a family, Sue and Tom, and settled into work as a PMG technician in telephone exchanges. He had a fondness for relays and treasured into retirement his set of relay adjusting tools!

He was an active member of the Moorabbin and District Radio Club as VK3APO. Son, Tom, remembers many happy camping trips in the family Kombi, ham conventions and field days, and operations from most of the Victorian national parks.

Back onboard

In the 60s, Phil went back to sea with AWA Marine, signing on the Baralga that delivered cargo to Darwin – most importantly, of course, the beer. Throughout this period, Phil operated VK3APO/MM and made many friends on the Melbourne/Sydney to Darwin voyages.

A particularly memorable occasion was in Sydney, alongside in Woolloomooloo Bay, when a group of lads from the Sydney Marconi School of Wireless came on board, a most inspirational time; I think most of us got our tickets and went to sea! With retirement of the Baralga, Phil continued the Darwin run on the new Newcastle-built ship, Darwin Trader/VLDT.

Finally ashore

In the mid-70s, Phil came ashore, this time to the home port of Sydney and became VK2BTT, active in the Liverpool and District Radio Club, the Liverpool RSL Sub Branch and the MV Cape Don/VLFQ, the ex-lighthouse tender under restoration at Balls Head in Sydney Harbour.

In May 2013, Phil was a member of the Australian contingent who attended the commemoration of the 70th Anniversary of the Battle of the Atlantic, in Liverpool and London in the UK, and proudly wore his six wartime medals.

In 2016, with dementia darkening Phil's life, son Tom most properly returned him to a nursing home in Melbourne where he lived comfortably until passing away quietly in the early hours of 30 September 2021, just a month short of his 100th birthday!

Visit the Department of Veteran Affairs website to see Phil himself describing some of his experiences! https://tinyurlcom/45hdbnc5

de Colin Christiansen, VK2BCC

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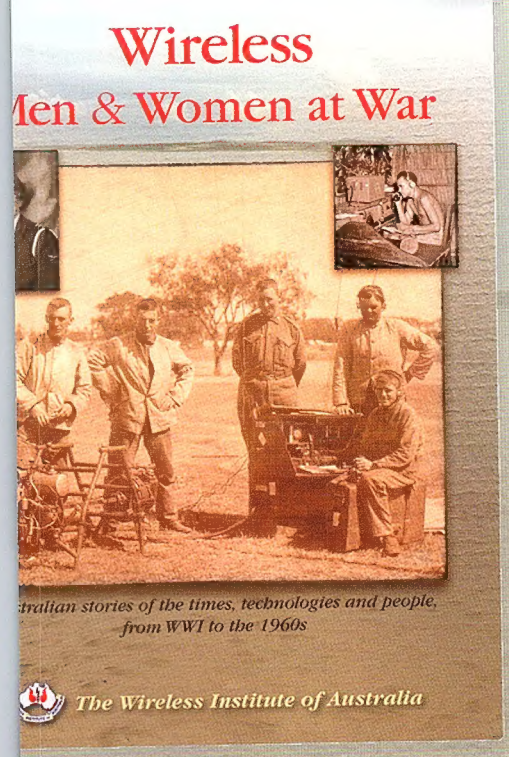

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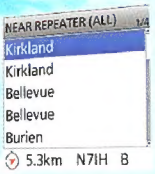

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